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BOTULISM CASE REPORT SUMMARY
LOS ANGELES COUNTY, 2013

Moon Kim, MD, MPH

Four cases of botulism were reported in 2013 that met case definition (four probable, one confirmed). All cases survived. All four cases were wound botulism cases. All four had a history of injection drug use with heroin. One was confirmed by mouse bioassay on serum for toxin A performed by the Los Angeles County Public Health Laboratory and two were classified as probable cases by the Centers for Disease Control and Prevention's (CDC) Matrix-assisted laser desorption/ionization-Time of Flight (MALDI-TOF) test for toxin A in serum[1]. One case was classified as a probable case based on history and clinical criteria. This case had history of black tar heroin use and presented with respiratory failure and was intubated in the emergency room; serum and stool collected almost three weeks after symptom onset were negative for botulism toxin.

Two additional reports of suspected botulism did not meet case definitions for confirmation. One patient was thought to have Miller Fisher variant of Guillain-Barré syndrome or myasthenia gravis as symptoms improved, antitoxin was never administered, and serum was negative for botulism toxin. The other patient was an injection drug user who presented with a clinical picture similar to botulism. He received antitoxin and intravenous gamma globulin, serum was negative for botulism toxin.

The local health department's only responsibility for infant botulism is immediate telephone reporting of suspected cases to the California Department of Public Health's (CDPH) Division of Communicable Disease Control. All suspected cases are investigated by the CDPH Infant Botulism Treatment and Prevention Program.[2]

[1] Barr JR, Moura H, Boyer AE, Woolfitt AR, Kalb SR, Pavlopoulos A, et al. Botulinum neurotoxin detection and differentiation by mass spectrometry. Emerg Infect Dis. 2005; 11 (10): 1578-1583
[2] Infant Botulism Treatment and Prevention Program. Division of Communicable Disease Control, California Department of Public Health. http://www.infantbotulism.org/.

PERTUSSIS CLUSTERS IN LOS ANGELES COUNTY SCHOOLS, 2013

A Nelson EL Amin, MD, MPH and Emmanuel Mendoza, MPH

INTRODUCTION

Since the California resurgence of pertussis in 2010, during which 972 pertussis cases were recorded in the Los Angeles County Health Jurisdiction with four infant deaths, the number of cases over subsequent years has steadily fallen, reaching near base-line levels in 2012 when 154 annual cases were reported. During the first six months of 2013, the State of California Immunization Branch documented a state-wide increase in pertussis cases, especially among children of middle to high school age, particularly notable in Northern California counties.

In the Los Angeles County Health jurisdiction, the number of year-to-date pertussis cases continued to be less than what was observed during the corresponding time period in 2012 until early November of 2013 when a definite increase in pertussis cases was noted. The year (2013) ended with 283 total pertussis cases having been reported, an 84% increase over what was reported in 2012. One contributing factor to this increase was a large number of pertussis cases among middle to high school-aged children attending five schools in the northern area of Los Angeles County. This increase in pertussis cases occurred despite the California middle-school Tdap vaccination requirement that was first implemented in 2011 (1). This report describes the cluster of pertussis cases that occurred at each of the five schools.

METHODS

Pertussis cases at each of the schools were assessed by a review of final contact investigation records with regard to time of symptom onset, temporal relationship to other pertussis cases at the same school, and in the same classroom, as well as, other linkages among the students. Cases are listed in the order that they developed symptoms, which did not always equate to the order in which they were reported to the Los Angeles County Department of Public Health.

Following the first case at a school, subsequent cases were classified as cohort cases if they occurred less than five days after the previous case, based on the fact that occasionally, the incubation period for pertussis can be as short as five days.

In accordance with this health jurisdiction's pertussis containment procedures, close family members and other social face-to-face contacts of pertussis cases, (especially persons at high risk of complications if they develop pertussis) were offered pertussis post-exposure prophylaxis (4). Asymptomatic, unvaccinated students, in the same classroom as the pertussis case, were given the option of one-time post-exposure prophylaxis, in lieu of being excluded from school for 21 days. Asymptomatic unvaccinated students who received post-exposure prophylaxis once, did not receive repeat prophylaxis if re-exposed to another case but were monitored for signs and symptoms of pertussis and treated (with exclusion from school for five days of treatment) if pertussis signs and symptoms developed.

RESULTS (refer to Tables 1 and 2, and Chart 1)

Of the total 38 cases included in this report, 30 were PCR positive and met the Centers for Disease Control and Prevention (CDC) clinical criteria for pertussis (two weeks or more of cough, with either paroxysmal coughing or post-tussive vomiting or an inspiratory whoop) (2). Seven (7) of the 38 cases were PCR positive, and had a cough illness of varying duration but did not meet the clinical criteria for pertussis. These seven cases were classified as "suspect" pertussis cases because of their positive PCR status, in accordance with California Department of Public Health Immunization Branch surveillance guidelines (3). One (1) of the 38 cases had an equivocal PCR test result but met the clinical criteria for pertussis and was therefore labeled a "probable" pertussis case.

School A – Student Population: 2,170

Case 1 had onset of cough illness on 9/3/2013 while case 2 had onset of disease on 9/22. Case 3, who shared two classes with case 1 and one class with case 2, became ill on 9/24. Additionally, case 3 participated on a community volleyball team with a student from another high school (referenced later) who developed pertussis on 11/27. Cases 2 and 3 are in the same cohort regarding time of disease onset.

Cases 4 and 5 had disease onset dates of 11/4 and 11/8, respectively and although they were cohort cases, did not share any classes with cases 1, 2, and 3. However, cases 4 and 5 both participated in the school band. Case 6 had onset of cough on 11/17. Case 7 had disease onset on 12/1 and was exposed to cases 4 and 5 during participation in the band. Case 7, also, shared a class with case 4.
Case 8 had onset of cough on 12/10 and shared a class with case 6.

School B – Student Population: 400

Case 1 had onset of cough illness on 9/9 and did not share classes with any of the subsequent cases that occurred at his school. Cases 2 and 3 had disease onset dates of 10/8 and 10/18, respectively. Case 4 became ill on 10/26 and shared five classes with case 2. Case 4 was, also, a sibling to case 3.

Case 5 had disease onset on 10/26 and was a sibling to case 2. Case 6 became ill on 11/9 and shared four classes with case 3. Case 7, who became ill on 11/16, shared one class with case 4 and a class with case 2.

The 8th and final case at this school had onset of disease on 11/27, shared three classes with case 3 and participated on the school volleyball team with cases 3 and 4.

School C – Student Population: 2,800

Cases 1 and 2 both had the onset of their symptoms on 10/25 and neither of them shared classes with other cases. Case 3 and 4 became ill on 11/4 and 11/27, respectively. Case 5, also, became ill on 11/27 and shared a class with case 3. Additionally, case 5 participated on the community volleyball team (previously noted) with a case from school A.

Cases 6 and 7 had the onset of their illnesses on 12/2 and 12/7, respectively and did not share classes with other cases. Cases 8 and 9 are siblings and both became ill on 12/16. Case 9 shared a class with case 3. Case 10 became ill on 12/22 and did not share classes with any other cases.

School D – Student Population: 218

Case 1 had disease onset on 11/18 and shared 6 classes with case 2. Case 2, a student who had not yet received the required Tdap booster vaccine dose, also, became ill on 11/18. Case 3 became ill on 11/27, and case 4, who shared six classes with case 3, became ill on 12/15. Case 5 became ill on 12/21 and did not share classes with other cases.

Most significantly, a school employee who worked in the attendance front office became ill with pertussis on 11/26 and may have transmitted disease to other cases for which no classroom linkages were identified. (Additional cases continued to occur at this school during January 2014 but are not included in this report.)

School E – Student Population: 3,000

Case 1 became ill on 11/28 and cases 2 and 3 both became ill shortly thereafter on 12/2. Case 4 had disease onset on 12/4 and shared a class with case 3. Case 5 had disease onset on 12/5 while case 6, who shared a class with case 5, developed a cough illness on 12/7. Case 7 became ill on 12/13 and shared a class with case 3.

Most of the cases at this school were cohort cases. However, case 7's illness may have resulted from classroom transmission. (Additional linked cases occurred at this school during January 2014 but are not included in this report.)

DISCUSSION

Multiple classroom linkages were identified among the majority of pertussis cases in most of the schools in this study. In some instances, pertussis cases shared as many as six classes with other pertussis cases, which probably resulted in intense exposures, contributing to disease in fully vaccinated children. Although multiple classroom linkages were identified for the cases in school D, most were among cohorts of cases who, with the exception of one, may have been infected from out-of-school contacts.

Non-classroom linkages, such as the school band and school volleyball team, were identified at two of the schools. Additionally, participation in a community-wide intramural volley-ball team linked pertussis cases at two of the schools.

School C had the highest number of pertussis cases but classroom linkages were identified for only two of the cases. However, as was observed during a meningococcal meningitis outbreak investigation at a high school in another region of California, adolescents often have patterns of intense social interaction at school, above and beyond classroom or other formal encounters (5). Also, at school C, two of the cases were siblings.

School C is located in a different community that is at the northern-most region of the area represented by all of the schools that were studied. It's possible that geographical factors, as well as, limited shopping options in that community (which could, paradoxically, facilitate a greater frequency of community contact) may have been responsible for increased non-school related exposures for persons attending school C. Additionally, one of the largest amusement parks in Southern California is immediately proximal to the communities served by all of the high schools in this analysis. This amusement park's unique rollercoaster rides, has always been a positive attraction for teens in the area, possibly contributing to teen intermingling and transmission of a disease like pertussis. However, because the students were not questioned regarding trips to the amusement park, no data is available to further assess the extent to which attendance at the park could have facilitated spread of pertussis within the community.

Our discussion would be remiss without a comment on the efficacy of one dose of pertussis vaccine as a preteen booster, as required by the California School law for students entering the 7th grade, especially since only one of the pertussis cases was under-immunized for pertussis (had not received the pertussis booster). A Tdap efficacy study in the State of Washington, that reviewed pertussis cases from counties with the highest case counts from January 1 through June 30, 2012, found that for adolescents who received all of their primary pertussis immunizations as acellular pertussis vaccine, the Tdap booster was about 75% effective in preventing pertussis within one year of Tdap vaccination but that level of effectiveness declined to only 40% or less two to four years after vaccination (6). When the total number of pertussis cases at the schools described in our report were stratified by grade level, the results showed a trend of fewer cases in grades 7 and 8 and more cases in grades 9, 10, and 11 (see chart 1), which supports a waning of vaccine effectiveness. However, it should be noted that the total number of pertussis cases observed during our analysis represented a very small percentage of the total student populations at each of the schools, suggesting a significant benefit from implementation of the 2011 middle-school Tdap requirement in California.

LIMITATIONS

A potential limitation of this analysis is that none of the pertussis specimens were submitted for *Bordetella pertussis* culture. However, the need to maintain fastidious culture media kits in physician offices, in order to ensure that specimens are kept viable for transportation to the laboratory, is a major limiting factor that prevents the widespread use of pertussis cultures to confirm the diagnosis in outpatient settings. The

providers serving the student population in our study area have all adopted PCR testing as practically more feasible.

Despite the lack of bacteriological culture results for any of the reported cases, the fact that 79 % of the PCR positive cases met CDC's clinical criteria for pertussis and could therefore be classified as laboratory-confirmed cases supports the classification of these cough illness clusters as pertussis outbreaks. Secondly, positive PCR results were obtained by various types of provider organizations (from small medical groups to large HMO organization such as Kaiser Permanente), minimizing the likelihood that a provider office contributing false-positives because of poor technique could significantly impact the results of this analysis. In an effort to minimize the potential for false-positive PCRs, providers we suspect might be obtaining false-positive results as a result of vaccine contamination are sent information regarding corrective steps.

Special acknowledgement and appreciation goes to the Los Angeles County Public Health Nurses in SPAs 1 and 2 who worked tirelessly to identify the intra-school and out-of-school linkages for the pertussis cases analyzed in this report.

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4. Los Angeles County Department of Public Health Acute Communicable Disease Control Manual (B-73) Part IV Acute Communicable Diseases, Pertussis.
5. Unpublished Communication; high school meningococcal outbreak.
6. Summary Report, Pertussis Vaccines Workgroup. Advisory Committee on Immunization Practices (ACIP). June 19-20, 2013.

COCCIDIOIDOMYCOSIS AMONG CAST AND CREW OF A TELEVISION SHOW

Patricia Marquez, MPH and Dawn Terashita, MD, MPH

Coccidioidomycosis (cocci), or valley fever, is a fungal disease caused by the inhalation of *Coccidioides immitis* spores that are carried in dust. Environmental conditions conducive to an increased occurrence of cocci include arid to semi-arid regions, dust storms, hot summers, warm winters, and sandy, alkaline soils. This fungus is endemic in the northern part of Los Angeles County and much of the central valley of California. Exposure and risk for infection occurs when soil is disturbed and the spores become aerosolized; for this reason cocci is a known risk factor in construction and other outdoor, manual labor type jobs in these areas. We describe an outbreak of cocci among the cast and crew of a television show that was associated with an outdoor shoot in a cocci endemic area.

On March 25, 2013 the Los Angeles County Department of Public Health (LAC DPH) was contacted by, the Centers for Disease Control and Prevention (CDC) Epidemic Intelligence Service Officer at the California Department of Public Health (CDPH). CDPH had identified a cluster of coccidioidomycosis workers' compensation claims from a state occupational health database. The suspected location of exposure was a ranch located in Simi Valley, which is a film location that is used in outdoor shoots for movies and TV. The cluster involved crew from a TV show, and an on-location shoot from January 17-19, 2012. The shoot recreated an outdoor music festival, and it was suspected that exposure was created during the construction of sets that dispersed a lot of soil and dust or during the shoot through vehicular and foot traffic.

METHODS

CDPH provided a list of individuals from the same employer, Employer A, that had filed workers' compensation claims as well as a letter that the production studio, Studio A, distributed to cast and crew of the show shortly after identification of illness. CDPH provided LAC DPH with a list of eight claimants and medical records for four claimants. In the investigation a confirmed case was defined as any participant of the location shoot at the movie ranch who tested positive for coccidioidomycosis by any diagnostic method and had clinical symptoms consistent with cocci.

LAC DPH contacted the Environmental, Health and Safety Director for Studio A, who signed off on the notification letter. This safety director indicated he drafted the letter and sent it to the production manager. He stated he was unsure who received notification and how; he assumed the letter was posted in common areas for all to see. LAC DPH obtained a roster of approximately 655 employees from the production company to identify other cocci cases. Cross referencing the roster of cast and crew with the LAC DPH coccidioidomycosis surveillance database did not identify other ill individuals. A comparison of the roster with the worker's comp database and state reportable disease database conducted by CDPH also did not identify any other ill individuals.

An initial web search conducted by CDPH using terms specific to the name of the show and the site filming location led to fan websites, revealing that this particular episode of the television series was set primarily in an outdoor music event modeled after the Coachella Music Festival in Coachella, California. An LAC DPH web search of the name of the show and coccidioidomycosis identified one of the stars of the show as having been diagnosed with the disease and hospitalized at an LAC hospital in February 2012. This case regularly sent Tweets (social media messages) throughout their hospitalization, though they did not identify additional cases or suggest an outbreak. Upon interviewing this case we identified another patient who also met the case definition, a visitor to the set. Additional web searches identified an extra of this show that had been diagnosed with coccidioidomycosis but had not been on the set of

suspected exposure. Therefore, he is not considered a case in this investigation. Interestingly, he had been on a different ranch, for a different show, during his exposure period for coccidioidomycosis. Phone calls and attempts at contact were made for all individuals reported by CDPH and identified by social media; LAC DPH interviewed seven of the ten.

RESULTS

Of the ten cases identified, seven were male; median age was 37 years (range 23-58). Half (5) of the cases were actors, three were sound/camera operators, one was involved in construction of the sets and another was a visitor to the set (Table 1). The mean time to symptom onset was seven days (range 3-26 days). Of the ten cases identified during the investigation only two engaged in soil-disrupting activities during or immediately preceding the filming event. However, interviews with employees indicated that substantial manual digging and operating of heavy machinery was required for set construction, including erecting an amusement park and a large stage, and digging a large mud pit. Several cases indicated they were shuttled up to the set location from the main parking area of the ranch, and these shuttles generated a lot of dust up and down the roads. Two cases stated there was a water truck onsite at the film location, though we did not specifically ask about the conditions of the soil while digging. Five of the seven interviewed case patients reported dry dusty conditions during the filming event. Almost all sources of identification of cases were through Doctor's First Report of Occupational Injury and Illness (DFR).

A total of five confirmed cases, and five probable cases were identified from the investigation. A probable case had compatible clinical criteria and was present at the filming event. Severity of illness ranged from mild flu-like symptoms to pneumonia. Two cases were diagnosed with pneumonia and hospitalized at an LAC hospital; one case for four weeks the other for two days. These two cases experienced severe cough, fatigue, shortness of breath, chest pains and high fever. The remaining eight cases experienced cough, fever, fatigue, headaches and muscle pain for lengths varying two to four weeks. One case did experience a rash during the course of their respiratory illness. Two cases were seen as outpatients at a clinic that is affiliated with the entertainment industry. One case was seen at an LAC hospital and then treated at a hospital in Arizona. Four cases visited an ED for their illness.

DISCUSSION

The ten cases identified out of 655 employees reported by the production company yielded an attack rate of 1.5% for the on-location shoot. The onset of illness and the epidemiologic findings indicates the outdoor shoot as the most likely source of exposure for this cluster. Social media was useful in identifying two additional cases and a unique, though unrelated, case among an extra of that show that was not on this particular set. Social media technology permits the sharing of information, and is stored online indefinitely, to be readily searched when needed. Also, the millennial generation's increased willingness to share online may allow public health to connect the dots among cases in a wide spread of location and time.

Table 1. Coccidioidomycosis outbreak case characteristics

Case #	Confirmed/Probable	Interviewed	Occupation	Exposure period	Time to Illness	Hospitalized	Symptom Duration	Identification Source
1	Confirmed	Yes	Actor	3 days	5 days	4 weeks	4 weeks	Social Media
2	Probable	No	Actor	3 days	26 days	No	unk	DFR
3	Confirmed	Yes	Actor	3 days	4 days	No	1 week	DFR
4	Probable	Yes	Actor	3 days	3 day	No	3 weeks	DFR
5	Probable	No	Actor	3 days	unk	No	unk	DFR
6	Probable	No	Sound tech	3 days	13 days	No	unk	DFR
7	Confirmed	Yes	Camera operator	3 days	20 days	No	6 mos	DFR
8	Probable	Yes	Construction Manager	4 days	7 days	No	3 weeks	DFR
9	Confirmed	Yes	Prop Maker/built sets	3 days	2 days	No	4 weeks	DFR
10	Confirmed	Yes	N/A (visitor)	3 days	13 days	2 days	3 weeks	Patient Interview

LEGIONELLOSIS OUTBREAK AT A HOSPITAL ONCOLOGY UNIT

L'Tanya English, RN, MPH and Moon Kim, MD, MPH

BACKGROUND

Legionellosis, or Legionnaires disease (LD), is an opportunistic infection caused by the gram negative bacteria, *Legionella* species (spp.), which thrives in natural and man-made water environments. It is ubiquitous in nature and can be found in large water sources such as lakes, streams, and rivers. It also grows in man-made water environments such as hot and cold domestic water systems, water heaters, storage tanks, cooling towers and humidifiers.[1]

In the hospital setting, *Legionella* spp. can be found in the water system, tap water faucets, tubs and showers, whirlpool baths and fountains. Per the Centers for Disease Control and Prevention (CDC) Healthcare Infection Control Practices Advisory Committee (HICPAC) 2003 Guidelines for Environmental Infection Control in Health-Care Facilities, "In several hospital outbreaks, patients have been infected through exposure to contaminated aerosols generated by cooling towers, showers, faucets, respiratory therapy equipment, and room-air humidifiers."[2]

Legionella transmission is via inhalation or direct aspiration from a water source contaminated with *Legionella* spp. Individuals who are immunocompromised or have underlying medical conditions are at highest risk for *Legionella* acquisition.

On July 1, 2013, Los Angeles County Department of Public Health (LAC DPH) Acute Communicable Disease Control Program (ACDC) received electronic notification of a single case of *Legionella pneumophila* serogroup 1 (LP1) from Hospital A. After review of additional clinical and laboratory data, ACDC determined that the infection was healthcare-associated (HA) based on CDC criteria and recommended a six-month retrospective review of patients with nosocomial pneumonia and prospective *Legionella* surveillance for at least two months at the end of the six-month retrospective surveillance period. On July 22, 2013, the infection preventionist (IP) notified ACDC of a second patient who was LP1 urinary antigen positive and occupied the same room after the first patient was discharged, and an outbreak investigation was initiated.

METHODS

Case Definition

A case was defined as a patient at Hospital A who was laboratory-confirmed LP1 urinary antigen positive between June 29, 2013 and July 30, 2013. A definite HA case was defined as a patient hospitalized ≥10 days continuously prior to the symptom onset. A possible HA case was defined as a patient hospitalized for two to nine days prior to symptom onset.

Case Characterization

ACDC conducted a comprehensive review of case clinical, laboratory and related records.

Case Room Review

ACDC reviewed the room locations for both cases from admission to discharge.

Control Measures

Multiple infection control measures were implemented by Hospital A upon identification of the positive cases.

Background *Legionella* Surveillance

ACDC reviewed all *Legionella* Confidential Morbidity Report (CMR) forms received between January 2011 and July 2013. In addition, patient epidemiologic background data was reviewed.

Facility *Legionella* Surveillance

The IP conducted six months retrospective surveillance from January 26, 2013 through June 26, 2013 to identify previous HA cases and prospective surveillance from June 26, 2013 through August 26, 2013 to identify additional HA cases as recommended by ACDC. Prospective surveillance continued through December 2013.

Site Investigations

Multiple joint site investigations with LAC DPH Environmental Health (EH) were conducted throughout the outbreak to gather additional information, update the status, collect environmental samples and observe the water remediation treatment.

Facility Construction, Repair and Remediation

There was a hospital-wide construction prior to the outbreak. On the oncology unit, there was major construction to a room that is adjacent to the case patients' room B. Construction activities involved removal of plumbing fixtures and water shut off to the room.

LAC DPH Environmental Sampling

LAC DPH EH collected swab and water samples, prior to the initial water remediation. All samples were submitted to the LAC Public Health Laboratory (PHL) for *Legionella* testing.

Facility Environmental Sampling

Hospital A hired an outside environmental consultant (OEC) to collect and test environmental samples. The OEC laboratory participates in the Environmental *Legionella* Isolation Techniques Evaluation (ELITE) program that is CDC-certified.

Facility Water Remediation and Water Management Plan

A plan for water remediation was developed by the OEC after the initial facility and LAC DPH water sampling results were available. The facility also developed an ongoing water management plan to address *Legionella* in the water system as directed by LAC DPH EH.

RESULTS

Case Definition

Two patients met the case definition which was based on CDC criteria. Case 1 was defined as a definite case and Case 2 was defined as a possible case.

Case Characterization

Case 1 was admitted from home through the emergency department (ED) to the telemetry unit on June 6, 2013. Diagnoses on admission were sepsis, leukocytosis and severe psoriasis. Temperature was normal and no complaints of cough, shortness of breath or difficulty breathing were noted. Physical assessment indicated the chest was clear with no wheezing, rales or rhonchi. A chest x-ray (CXR) on admission showed no infiltrate, consolidation, effusion, or increase in vascular markings.

On June 22, 2013, Case 1 transferred to the oncology unit, room B, due to census concerns and bed availability. On June 26th, Case 1 became symptomatic with a fever and new onset of respiratory symptoms. A urinary antigen on June 29, 2013 was LP1 positive, 23 days after admission. A CXR the same day showed an increase in moderate lung edema or infiltrate bilaterally. A physician progress note from June 30, 2013 indicates "persistent fevers overnight, chest x-ray suggestive of hospital-acquired pneumonia". Antibiotic treatment was initiated. Case 1 received nebulizer treatments from June 14, 2013 to July 11, 2013. Case 1 did not shower during the hospitalization; only sponge baths were given.

Case 2 had a history of lung cancer with multiple metastases and was admitted from home on July 12, 2013 through the ED to the medical surgical unit. The diagnosis was back pain after falling at home. On admission, Case 2 had no complaints of fever, shortness of breath or cough; physical exam indicated good air entry with no wheezing or crackles. On July 19th, Case 2 transferred to the oncology unit, room B, developed new onset of respiratory symptoms and was urinary antigen positive on July 21st, nine days after admission. On July 22, 2013, CXR findings showed no consolidation, congestion or pleural effusion. Antibiotic treatment was initiated. On July 23, 2013, CXR showed a "right suprahilar or paratracheal mediastinal mass…there are small bilateral pleural effusions". Case 2 was discharged to a skilled nursing facility on July 25, 2013 and readmitted to the hospital on July 26, 2013. Computerized tomography of the chest indicated a tiny amount of pleural fluid in the lung bases. On July 29, 2013, a second urine test was negative for *Legionella* antigen. A routine sputum culture (not specific for *Legionella*) was negative on July 21, 2013. Case 2 received nebulizer treatments from July 20, 2013 to July 21, 2013. Case 2 did not shower during the hospitalization, only sponge baths were given.

Case Room Review

Both cases were transferred from other units to the oncology unit, room B, a single occupancy room. Case 1 was located in room B for five days, from June 22 to June 26, 2013. Case 2 was located in room B for four days, from July 19, 2013 to July 22, 2013. The facility voluntarily closed the room twice to new admissions after water testing identified *Legionella*. The room was initially closed on July 23, 2013, and reopened on October 22, 2013 after water hyperchlorination was performed on September 28, 2013. On November 21, 2013, the room was closed a second time after repeat water testing identified *Legionella* and reopened four days later after point of use water filters were placed on the sink and shower faucets.

Control Measures

On July 30, 2013, the ED ice machine was placed out of service on the recommendation of LAC DPH EH and was voluntarily removed from the ED by facility engineering on August 6, 2013. All hospital ice machines were cleaned and sanitized. All sinks that tested positive for *Legionella* spp. were descaled and disinfected and flushed. The oncology unit nurse's station sink was removed from service after testing positive for LP1. All plumbing fixtures in closed units located on floors above the oncology unit were also flushed.

Background *Legionella* Surveillance

There were ten confirmed community-acquired (CA) *Legionella* urinary antigen positive patients throughout the hospital in the two years prior to the 2013 cluster and no HA *Legionella* confirmed cases during the same time period. In 2011, there were three *Legionella* confirmed CA patients and in 2012 there were seven confirmed CA *Legionella* patients.

Facility *Legionella* Surveillance

Legionella surveillance was conducted by the IP and did not identify any additional cases. All patients hospitalized in room B from October 22, 2013 through November 26, 2013 were also assessed for respiratory symptoms. Patients with a history of respiratory symptoms on admission or who developed respiratory symptoms during their hospitalization were tested for *Legionella*. Nine patients occupied the room during this time period and only one patient had respiratory symptoms; urine test results were *Legionella* antigen negative. In December 2013, ACDC was notified of a patient on a different unit who

was *Legionella* urinary antigen positive two days past admission. CXR was normal on admission. Two days later the CXR showed a large right lower lobe infiltrate not present on admission. ACDC reviewed the medical records and determined that the *Legionella* infection was CA and not HA.

Site Investigations

ACDC conducted multiple site investigations. Entrance and exit conferences were held in addition to a walkthrough of the affected unit and other areas of the facility that the two cases may have shared in common. The initial site investigation was conducted on July 30, 2013. The oncology unit, and several other areas both cases shared in common, e.g., the ED and post-anesthesia care unit, were toured. Two live plants were observed at the oncology unit nurse's station, both were removed. In the patient food pantry, there were two basins under the sink, one with water bottles and paper towels, the other with a used cloth towel. Both were immediately removed. On July 31, 2013 and August 2, 2013, DPH returned to collect environmental water and swab samples for testing by the LAC PHL. LAC DPH provided preliminary management recommendations during the exit conference. On October 22, 2013, LAC DPH conducted an onsite meeting to discuss the status of the outbreak, next steps, and future LAC DPH surveillance.

Facility Construction and Repair/Remediation

In June 2013, major construction occurred on the oncology unit in room C, which is adjacent to room B on the same side of the unit. There were appropriate construction signs visibly posted as well as a hard wall barrier in place with tacky mats at the entrance. The floor below the oncology unit was undeveloped shell space with water going to the oncology unit and dead-end pipes throughout.

LAC DPH Environmental Sampling

LAC DPH collected 29 environmental samples on July 31, 2013 and August 2, 2013. Three samples that were collected from a nursing station hand washing sink on the oncology unit were positive for LP1, the same serogroup found in the two cases. *Legionella* spp. or *Legionella*-like organisms were isolated from 21 additional samples collected throughout the facility. Five samples had no growth of *Legionella*.

Facility Environmental Sampling

Two-hundred forty water or swab environmental samples were collected by the OEC from various locations throughout the facility between August 2013 and December 2013 (148 water, 92 swabs). Of these, 67 (28%) samples were *Legionella* culture positive. LP1 was found in two water samples and one swab sample on sinks in two non-patient care areas. *Legionella* spp. 2-14 and *Legionella* spp., non-*pneumophila* were also found on the oncology unit in addition to other patient care and non-patient care areas.

Facility Water Remediation and Water Management Plan

In September 2013, the OEC conducted hyperchlorination of the domestic potable hot and cold water systems to the main facility building. Additional water hyperchlorination was conducted in December 2013. A comprehensive water management plan was developed to manage and control bacteria identified in the water system. The plan included the hot and cold potable water, industrial water and the fountain water supply, cooling towers and ice machines. The plan addressed critical control point determination, routine and emergency maintenance and disinfection, water treatment, outbreak investigation and subsequent actions to be taken. It also addressed plan review and evaluation. A multi-disciplinary water management team oversaw the plan implementation.

DISCUSSION

We document our investigation of two cases of HA LD among patients hospitalized on the oncology unit. Since its first recognition in 1976, much more is known about LD and the occurrence of *Legionella* in man-made water environments or other water systems. According to Stout and Yu, "*Legionella* spp. have been shown to colonize 12-85% of hospital water systems."[3] Transmission is via inhalation and certain circumstances can increase the likelihood of *Legionella* colonization in man-made water environments, including temperature of 25-42°C, stagnation and scale and sediment.[4]

Hospital A's water system is supplied by the Los Angeles Department of Water and Power, and the water is chloraminated which presumably inhibits *Legionella* growth. Sink faucets on the oncology unit are equipped with non-aerator laminar flow devices. Numerous environmental samples obtained by LAC DPH and the facility were positive for *Legionella* spp., including LP1. LP1 was not found in the water in room B, however *L. pneumophila* serogroups 2-14 were found in room B. Both LP1 and *L. pneumophila* serogroups 2-14 were found in multiple other sites in the water system.

There was construction on the oncology unit immediately prior to the outbreak. In June 2013, major construction began on a room adjacent to room B on the same side of the unit. Construction involved removal of plumbing fixtures and water shut off. In addition, two nursing units on the 4th and 5th floors were closed, so water usage was inactive.

Due to the absence of clinical patient cultures for legionella, a molecular link could not be established with environmental samples. However, epidemiologic links existed between the patients. Both cases occupied room B, both were tested for *Legionella* after the onset of new respiratory symptoms and both received antibiotic treatment for legionellosis. Water exposure during the hospitalization was minimized; both cases received nebulizer treatments. In addition, major construction to a room adjacent to room B on the oncology unit, and the floor below had dead-end water pipes which have been shown to collect stagnant water and support microbial growth that could lead to *Legionella* transmission.[5] Lastly, in addition to the oncology unit, *Legionella* spp. was found in other patient care and non-patient care areas of the facility.

Case 2 initially had a positive urinary antigen test for legionella and then a negative repeat urinary antigen for legionella eight days later; however, since the sensitivity of the test is approximately 80%, a negative test does not rule out the presence of legionellosis. The legionella urinary antigen has a specificity of 100% so false positives are rare. A study by Kohler et al. showed that antigen excretion can be prolonged but it also showed that in some patients, the urinary antigen was no longer detected within several days of therapy.[6] Another possibility is that the initial positive test and then repeat negative test could also have been due to weak cross-reactivity with a non-LP1 serogroup *L. pneumophila*.[7]

Based on our investigation, both cases were likely exposed to legionella from an environmental source at Hospital A. No additional HA cases were identified after July 2013.

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INVESTIGATION OF PLATELET RICH PLASMA THERAPY AS POTENTIAL RISK FACTOR FOR HEPATITIS B INFECTION

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BACKGROUND

In June 2013, Los Angeles County Department of Public Health (LAC DPH) Acute Communicable Disease Control (ACDC) Program received a report of a patient (index case) with acute hepatitis B infection with onset in May, with elevated liver functions tests and positive for hepatitis B surface antigen (HBsAG) and immunoglobulin (IgM). The index case was interviewed by ACDC staff and the main risk factor identified during the incubation period (six weeks to six months prior to the onset of symptoms) for acute hepatitis B virus (HBV) infection was treatment in February with platelet rich plasma (PRP) therapy, a type of autologous blood injection, at an outpatient orthopedic clinic (Facility A). The PRP procedure was performed during the incubation period for the index case's infection with acute hepatitis B. The index case underwent a second PRP procedure in May, while symptomatic with HBV infection.

METHODS

Chart Record Review

Chart abstraction was conducted of the index case, and the three other patients that underwent PRP procedure at Facility A one week prior to and three days following the index case first PRP procedure.

Case Finding

Case definition: A case of acute hepatitis B was defined as an acute illness with a discrete onset of any sign or symptom consistent with acute viral hepatitis (e.g., fever, headache, malaise, anorexia, nausea, vomiting, diarrhea, and abdominal pain), and either a) jaundice, or b) elevated serum alanine aminotransferase (ALT) levels > 100 IU/L, and HBsAg positive, and IgM antibody to hepatitis B core antigen (IgM anti-HBc) positive (if done). A case of chronic hepatitis was defined as hepatitis B core antigen (IgM anti-HBc) negative and positive HBsAg.[1]

Facility A staff identified all patients that were seen one week prior to and three days following the index case's PRP procedure. Additionally, Facility A was asked to identify patients that received lidocaine injections and PRP seven days following the index case's second PRP procedure. The names of patients were entered into the LAC DPH hepatitis B database registry. The patient names were also submitted to the California Department of Public Health (CDPH) for cross checking in their HBV registry.

Facility A contacted the select patients by phone or email to request they be tested for hepatitis B either at Facility A, the patient's primary physician, or the local public health center. Hepatitis B vaccination status was requested of office healthcare workers, or blood testing for hepatitis B if vaccination status was not ascertained or available.

Site Visits

An initial site visit was made to Facility A by ACDC medical and nursing staff. ACDC interviewed the front office manager and back office supervisor, toured the clinic, conducted chart abstraction, reviewed medication storage and preparation areas, and observed a mock demonstration of the PRP preparation by the unlicensed back office manager, who is the designated person to prepare PRP. Infection control deficiencies were identified and corrective actions were verbally discussed with office staff and sent through a summary letter.

[1] CDC CSTE 2012 Hepatitis B, acute, case definition
http://wwwn.cdc.gov/nndss/script/casedef.aspx?CondYrID=711&DatePub=1/1/2012%2012:00:00%20AM

A second site visit was made by ACDC nursing and epidemiology staff to obtain updates of HBV laboratory testing, vaccination verification of patients and office staff, review updated office infection control policies and procedures, and see the new centrifuge obtained for PRP processing.

Consultations
ACDC requested information from the centrifuge manufacturer, "Manufacturer X", regarding the specific cleaning guidelines and correct use of the equipment devices. ACDC inquired with the company that purchases the centrifuges from Manufacturer X and private labels them as "Brand Y" for information regarding the appropriate use of equipment devices. ACDC contacted the Food and Drug Administration (FDA) as the centrifuge device is FDA registered, in addition to the Centers for Disease Control and Prevention (CDC) and CDPH for consultation and guidance.

RESULTS

Medical Record Review
The medical record review verified that a total of four patients including the index case received PRP one week prior to and three days following the index case's PRP procedure. The index case also received a second PRP procedure in May.

Case Finding
A total of 155 patients were seen in Facility A during the time period requested in February. Fourteen patients were identified through billing codes as receiving PRP or lidocaine injections including the index case; four of the 14 patients received PRP procedure. A total of four patients received lidocaine injections and only the index case received PRP during the May time period.

A total of 159 patient names and ten office staff member names were entered into the LAC DPH and CDPH hepatitis B database registry to determine if any had been previously reported with HBV infection. There were no hepatitis B cases identified in patients or staff members through this search.

In total, 15 of the 17 patients that had either a PRP procedure or lidocaine injection had a blood test for HBsAG, HBsAB, HBcAB, and HB IgM. All tested negative for chronic or acute hepatitis B. Eight of the ten current office staff members were either tested for hepatitis B or provided documentation of hepatitis B vaccination. Two of the ten were no longer employed at the facility. Four staff members tested negative for chronic hepatitis B, three provided documentation of hepatitis B vaccination, and one started the hepatitis B vaccination series.

Site Visits
In August, ACDC staff conducted a site visit to perform chart abstraction of the four patients (including the index case) that had undergone a PRP procedure during the time period in question.

ACDC staff interviewed the back office supervisor regarding infection control procedures and injectable medications used during the PRP procedure and other clinic medical procedures. Routine injectable multi-dose and single-dose medication vials used during office procedures were stored in each office exam room. Vials of medications were open and stored without a date of opening, and the single-dose vials of lidocaine were open and being used incorrectly for multiple patients. Expired vials of medication were observed in the exam room cabinets and also in the medical supply room refrigerator. The back office medical staff prepared injection supplies according to guidelines outlined by the physicians. All injections were reportedly drawn and administered by the physicians only. Other medications stored in the medical supply room refrigerator included pre-filled syringes of Synvisc® and Euflexxa™, which were dedicated to individual patients and administered by the physicians only.

ACDC asked the back office supervisor to provide a mock demonstration of their usual way of preparing for the PRP procedure. The representative who provided the training and sold the Brand Y Centrifuge and PRP system to Facility A was present during the mock demonstration. A designated single centrifuge is used for all patients requiring PRP therapy. ACDC observed demonstration of the routine cleanup of the Brand Y centrifuge and environmental areas after the PRP preparation was completed. The back office

manager and the representative reported that blood often leaks out of the concentrating device into the metal centrifuge buckets that holds it during centrifugation. If any gross blood is noted, it was reportedly cleaned and disinfected by using CaviWipes®, an intermediate-level surface disinfectant towelette. A policy for PRP preparation, procedure and cleaning was not available.

The cast room contained a steam sterilizer used for disinfection of suture removal equipment; however, there were no written protocols or practice in place for monitoring or assuring sterility of autoclave using biological indicators as indicated by the manufacturer.

During the July site visit, ACDC observed several infection control deficiencies and had concerns for potential blood borne pathogen exposure risks for the healthcare workers performing the PRP and the patients receiving PRP since there were reportedly times when blood escaped from the concentrating devices into the centrifuge buckets. There was inadequate cleaning and disinfection of the centrifuge and device between PRP procedures. Facility A lacked policies and procedures for infection control, PRP preparation, procedure, and cleaning. ACDC observed incorrect use of single-dose vials of medication, storage, and preparation; policies and procedures related to medication preparation, storage and administration were not available.

ACDC recommended immediately stopping all PRP procedures and using a centrifuge and PRP device system from a manufacturer that does not allow for blood leakage out of the system as there was concern for blood borne pathogen exposure.

ACDC provided other recommendations to Facility A such as: discontinued use of single-dose vials of medications for multiple patients, development of infection control procedures/guidelines for PRP preparation, use of aseptic technique, and cleaning/disinfection of the PRP centrifuge according to manufacturer instructions. Other recommendations included the development of policies and procedures related to medication storage, preparation, and administration, safe injection procedures, correct use of single-dose and multi-dose vials, and assuring sterility of the sterilizer by using biological indicators (e.g., Attest™ by 3M). In addition, ACDC suggested providing regular infection control training for healthcare staff and performing regular competency evaluations.

ACDC requested records of hepatitis B vaccination or immunity for all office healthcare employees who were at risk of exposure to blood borne pathogens.

In August, ACDC staff returned to Facility A for a second site visit. Office policies and procedures were developed for areas specifically noted to be deficient during the initial site visit in July, including centralized storage of medications, mechanisms implemented to review mediations on a weekly basis, discontinue ordering and use of single-dose vials, dating opened medication vials and discarding within 28 days or sooner if not used, and weekly monitoring of sterility of sterilizer using a biological indicator as recommended by the sterilizer manufacturer.

The PRP procedures were discontinued as recommended by ACDC on the first site visit, however, the centrifuge machine which had been used for PRP procedure had been exchanged for another one. The new centrifuge system was the same as the previous model and manufacturer, except for the addition of plastic caps that were being placed on top of both buckets without screwing on during the centrifugation. The newly created office policy and procedure for the PRP preparation, administration and cleaning did not address positioning of the caps onto the buckets or the appropriate cleaning of the centrifuge, caps and equipment after each patient use.

After the initial site visit in July, ACDC recommended that Facility A change their PRP equipment to ensure no leakage and risks for blood borne pathogen transmission. The addition of the plastic caps as observed during the second visit in August did not guarantee elimination of risk of blood borne pathogen exposure and was still not consistent with the centrifuge manufacturer's instructions. In August, ACDC continued to recommend Facility A discontinue PRP procedures and to follow the correct manufacturer's instructions/guidelines.

Consultations

ACDC sent a letter to the Brand Y Corporation Director of Regulatory Affairs informing them of the findings reported by Facility A of blood leaking out of the concentrating device (on more than one occasion) into the metal centrifuge bucket that holds it during centrifugation. ACDC informed Brand Y so they could take the appropriate actions with respect to the centrifuge and container leaks which include mandatory reporting to the FDA.[2]

The manufacturer's Operator's Manual and Routine Maintenance of Centrifuges for the centrifuge machine used in Facility A for PRP stated to only use their screw-threaded buckets with the caps screwed on to create an aerosol-tight seal for safe use. According to Manufacturer X, any deviation from their instructions can result in potential infection control risks to the healthcare staff and the patients.

A discrepancy remained between the manufacturer's recommendations and Facility A's method for attaching the threaded caps to the buckets and the cleaning/disinfection of the centrifuge equipment.

CONCLUSIONS AND RECOMMENDATIONS

Transmission of blood borne viruses and bacterial infections have been associated with, and are known to occur due to, unsafe and improper injection practices by healthcare professionals in a variety of clinical settings throughout the United States.[3,4] Infectious agents, such as HBV, can be transmitted through indirect contact transmission, even in the absence of visible blood. Indirect contact transmission is defined as the transfer of an infectious agent (e.g., HBV) from one patient to another through a contaminated intermediate object (e.g., patient-care devices) or person (e.g., healthcare personnel hands). Patient-care devices may transmit pathogens if devices contaminated with blood or body fluids are shared between patients without proper cleaning and disinfecting between patients.

Although there were no other cases of hepatitis B identified during the investigation process, and the source of hepatitis B infection for the index case was not definitely connected to the PRP procedure, ACDC advised Facility A to adopt all recommendation conveyed to the facility since the Brand Y devices (both the centrifuge and the concentrating device containers) cannot be completely ruled out as a potential source for transmission of blood borne pathogens to patients.[5]

ACDC recommended that Facility A review the steps involved in the PRP preparation (including proper filling of the concentration device to prevent leakage), review the manufacturer's instructions, and resolve the discrepancies between Brand Y and the Manufacturer X centrifuge instructions. If not possible, ACDC recommended using a centrifuge and PRP device system from a different manufacturer that prevents any blood leakage out of the PPR system.

It is ultimately the responsibility of Facility A to ensure that PRP equipment is properly used, cleaned, and disinfected according to the manufacturer's instructions to eliminate any risk of blood borne pathogen transmission.

[2] The Medical Device Reporting (MDR) regulation (21 CFR 803) contains mandatory requirements for manufacturers, importers and user facilities to report significant medical device adverse events to the FDA. MDR Mandatory Reporting Requirements: Manufacturers are required to report to FDA when they learn one of their devices may have caused or contributed to a death or serious injury. Manufacturers must also report to FDA when they become aware that one of their devices has malfunctioned and would be likely to cause or contribute to a death or serious injury if the malfunction happened again.

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A MULTI-STATE OUTBREAK OF HEPATITIS A ASSOCIATED WITH COSTCO TOWNSEND FARMS ORGANIC ANTIOXIDANT BLEND BERRIES

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BACKGROUND

On May 31, 2013, the Los Angeles County (LAC) Department of Public Health (DPH) was made aware by the California Department of Public Health (CDPH) that a nationally distributed frozen food product, Townsend Farms brand Organic Antioxidant Blend, distributed in Costco stores (including LAC), had been linked to acute hepatitis A cases in New Mexico and Colorado. In response, the Acute Communicable Disease Control Program (ACDC) hepatitis surveillance unit began enhanced surveillance of all cases of acute hepatitis A infection and joined a multi-state foodborne outbreak investigation. Locally, this investigation involved collaboration with LAC public health programs to include: ACDC, Community Health Services (CHS), Environmental Health Food and Milk Program (EHFM) and the Public Health Laboratory (PHL). ACDC also worked closely with the California Department of Public Health (CDPH), United States (US) Food and Drug Administration (FDA) and Centers for Disease Control and Prevention (CDC) to help identify cases of hepatitis A linked to product consumption, identify a food source and other sources for exposures (restaurants, other food providers), remove the identified product from consumers, and provide post-exposure prophylaxis (PEP) to high risk contacts and persons who consumed the implicated product.

METHODS

ACDC initiated enhanced surveillance to identify additional acute hepatitis A cases associated with this outbreak from May 31 through August 31, 2013.

Case Definition

Minimal Criteria: Confirmed acute hepatitis A virus (HAV) infection meets the Counsel of State and Territorial Epidemiologists (CSTE) case definition for an acute case of hepatitis A: (1) discrete onset of sign or symptom consistent with acute viral hepatitis (fever, headache, malaise, anorexia, nausea, vomiting, diarrhea, and abdominal pain), and (2) jaundice and/or elevated serum aminotransference levels, and (3) immunoglobulin M (IgM) antibody to hepatitis A virus (anti-HAV) positive [1].

Confirmed Outbreak Case: A person with minimal criteria (noted above) and who meets one of the three following criteria: (1) reported consuming Townsend Farms brand Organic Antioxidant Blend, Harris Teeter brand Organic Antioxidant Blend, Woodstock Frozen Organic Pomegranate Kernels, or any other pomegranate product recalled for potential contamination with HAV in the 15-50 days prior to illness onset; or had the product in their freezer; or purchased the product per shopper card records; or has another clear exposure history to the specific product, or (2) genotype 1B HAV was recovered from a clinical specimen and no history of international travel to a country with endemic HAV genotype 1B infection, or (3) a known close contact to another confirmed case and was not exposed to any contaminated pomegranate products.

Case Investigation

ACDC notified LAC DPH CHS of the ongoing multi- state hepatitis A outbreak and provided additional case investigation questions to query warehouse store purchase of and/or consumption of frozen and fresh fruit and berries that occurred during the two to seven weeks prior to onset date. Acute cases of hepatitis A identified by CHS that met the minimal criteria were re-interviewed by the ACDC hepatitis A

investigation team using a standardized investigation questionnaire provided by the CDC. ACDC identified and re-interviewed previously reported acute hepatitis A cases with onsets from March 1 to May 31, 2013.

Laboratory Testing

Clinical laboratories were contacted to determine if serum samples were available for all confirmed cases without international travel history regardless of history of suspect product ingestion. If available, specimens were submitted to the LAC Public Health Laboratory (PHL) for shipment to CDC for confirmation of and genetic sequencing of hepatitis A virus.

Environmental Health

The LAC EHFM coordinated with CDPH, FDA, and Costco to monitor recalls and to inspect Costco and other retail locations to ensure that the recalled product was removed from the stores. EHFM reviewed the distribution list from Costco to determine how much product had been sold in LAC. EHFM also coordinated collection of the implicated product from acute outbreak cases and transfer to the FDA for testing.

Public Health Action

LAC DPH issued press releases notifying the public of the outbreak on May 31, 2013. CHS offered PEP to persons who had potentially consumed contaminated product within the previous 14 days and to household contacts of acute hepatitis A cases at CHS clinics from June 1 through June 14, 2014.

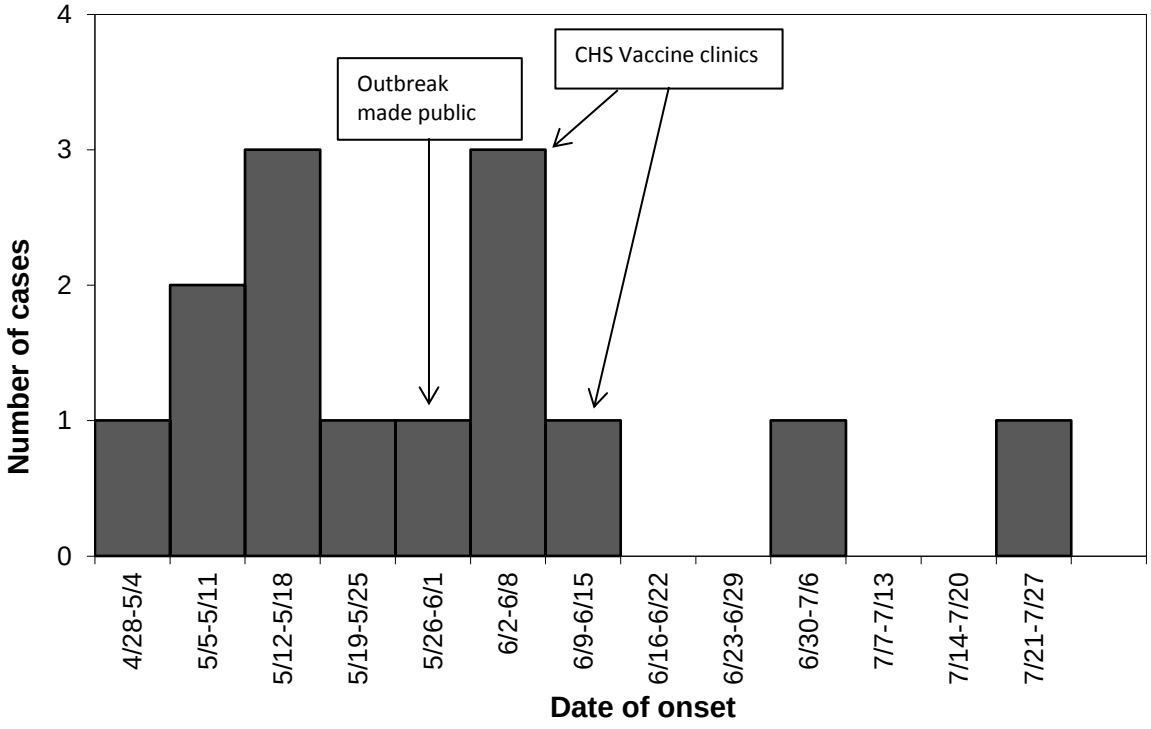
RESULTS

Case investigation

From March 1 to August 31, 2013, 14 cases were identified that met the confirmed outbreak case definition (Figure 1). The initial case identified had a symptom onset on the week of April 28th and the last case identified had a symptom onset during the last week in July. There were no secondary cases identified. The median case age was 50.5 years (range: 19-62) and 57% (8) were female. Ten (71%) cases were white non-Hispanic cases and the majority of cases resided in SPA 2 (n=6, 43%) (Table 1). Seven (50%) cases were hospitalized. Thirteen of the 14 cases reported eating Townsend Farms brand Organic Antioxidant Blend within two to seven weeks prior to symptom onset. One case reported no international travel and also denied consumption of the Townsend Farms brand Organic Antioxidant brand, however, pomegranate consumption was reported. This case matched the outbreak genotype strain.

Table 1. Demographics of LAC Confirmed Cases (N=14) Multistate Outbreak of Hepatitis A Virus	
Age (years)	**N (%)**
15-34	4 (29)
35-44	2 (14)
45-54	4 (29)
55-64	4 (29)
Gender	
Male	6 (43)
Female	8 (57)
Race/Ethnicity	
Asian	0 (0)
Black	1 (7)
Hispanic	3 (21)
White	10 (71)

Figure 1. Hepatitis A Virus Infection Associated with Consumption of Frozen Berry and Pomegranate



Laboratory

Of 14 cases, nine specimens were sent to CDC for serologic confirmation and viral sequencing; five cases did not have specimens available. Of the nine specimens provided to the CDC, six cases were found to have genotype 1b, the major outbreak strain; three of the cases could not be sequenced. Five of the six cases with genotype 1b reported consumption of the Townsend Farms brand Organic Antioxidant brand and one case reported no international travel and did not report consumption of the Townsend Farms brand Organic Antioxidant brand.

Environmental Health

EHFM reviewed distribution lists from Costco and determined that 3,000 units of the berry product were sold in LAC Costco stores from May 3 to May 31, 2013. EHFM visited eight Costco store locations and five stores of a local yogurt chain that had purchased Townsend Farms brand Organic Antioxidant Blend to verify that recalled product had been removed from the shelves. EHFM coordinated the transfer of remaining implicated product to the FDA; one confirmed case had product available.

Public Health Action

A LAC DPH press release on May 31, 2013 recommended against consuming contaminated product and also to obtain PEP for those who consumed the product in the last 14 days. CHS opened seven clinics on the weekend of June 1st and 2nd to provide hepatitis A vaccine or gamma globulin (IG) to those who potentially consumed the contaminated product within the last 14 days. PEP was also offered at 14 health clinics during normal business hours and for extended evening hours during two weeks from June 3 to June 14, 2013. CHS administered a total of 478 doses of hepatitis A IG and 417 doses of hepatitis A vaccine from June1 through June 14, 2013 (Figure 1).

DISCUSSION

During this investigation, ACDC identified 14 acute hepatitis A cases that met the outbreak case definition. Of these, thirteen cases reported consumption of the Townsend Farms brand Organic Antioxidant Blend berries. Six of the nine cases that were available for genotype studies matched the 1b genotype. The 1b genotype is a HAV genotype rarely seen in the US and commonly identified in the Middle East and North Africa [2]. EHFM made site visits to 13 Costco stores to ensure that the implicated product had been removed from store shelves. LAC DPH notified the public, recommending against consuming contaminated product and advised PEP for those who consumed the product in the last 14 days. CHS provided PEP to persons who consumed the contaminated product within the past 14 days, administering a total of a total of 478 doses of hepatitis A IG and 417 doses of hepatitis A vaccine from June1 through June 14, 2013. Prompt removal of the product and the provision of PEP to persons who consumed the implicated product may have prevented many additional cases of hepatitis A associated with this outbreak.

The preliminary CDC report indicates that from March 31 to July 26, 2013, 162 cases of hepatitis A were identified after eating Townsend Farms Organic Antioxidant Blend in ten states: Arizona (23), California (79), Colorado (28), Hawaii (8), New Hampshire (1), New Jersey (1), New Mexico (11), Nevada (6), Utah (3), and Wisconsin (2). [Note: The cases reported from Wisconsin resulted from exposure to the product in California, the cases reported from New Hampshire reported fruit exposure during travel to Nevada, and the case reported in New Jersey was a household contact of a confirmed case from Colorado.] Six of the confirmed cases were household contacts of confirmed cases (secondary cases) [2]. Nationwide, 117 specimens had the common HAV outbreak strain, genotype 1b.

Fecal contamination of foods that are not subsequently cooked are a potential source of HAV. This virus remains infectious for long periods under a variety of environmental conditions, including freezing [3]. Several hepatitis A outbreaks have been associated with the consumption of frozen fruit, including an outbreak associated with frozen strawberries in 1997 [4]. And while most outbreaks of foodborne hepatitis A are usually due to contamination of food by an infected food handler, contamination could occur during irrigation, harvesting, sorting, or processing [5]. Identifying an implicated source for the foodborne transmission for acute cases of HAV is challenging because of the long incubation period, 10-50 days prior to symptom onset. Cases must recall food purchase and intake history and also place of purchase. The outbreak investigation utilized targeted interviews with cases and shopper cards to help identify a source of infection.

By combining information gained from the FDA and CDC investigations, it was determined that the most likely vehicle for the hepatitis A virus appeared to be a common shipment of pomegranate seeds from a company in Turkey; Goknur Foodstuffs Import Export Trading. These pomegranate seeds were used by Townsend Farms to make the Townsend Farms and Harris Teeter Organic Antioxidant Blends and by Scenic Fruit Company to make the Woodstock Frozen Organic Pomegranate Kernels. On June 4 and June 28, 2013, Townsend Farms conducted recalls of certain lots of its frozen Organic Antioxidant Blend because of potential hepatitis A virus contamination. On June 26, 2013, Scenic Fruit Company recalled specific lots of Woodstock Frozen Organic Pomegranate Kernels because of potential hepatitis A virus contamination [2].

It is also likely that Costco stores also played an important role in the containment of this multi- state outbreak. Costco notified customers who purchased Townsend Farms brand Organic Antioxidant Blend and made HAV PEP available to purchasers. Using Costco card customer contact information, a series of robo-calls were made to Costco members informing purchasers that this product should be discarded and a product refund would be available. Additionally, selected Costco pharmacies provided hepatitis A vaccine as PEP or paid the cost of PEP from medical providers. The FDA, CDC and CDPH served as the primary contacts for Costco in California and other states. LAC DPH had minimal interaction with Costco with the exception of EHFM sites visits, to ensure that the implicated product had been removed from LAC stores. Costco has not shared the number of robo-calls made to LAC residents, vaccines and other PEP information provided with LAC DPH officials. Therefore, it is difficult to quantitate Costco's overall contribution to outbreak containment.

Determining the origination of the contamination was complex as there were multiple food products in the Townsend Farms' Organic Antioxidant Blend which originated from multiple countries. Identification of a potential source of pomegranate seeds originating in Turkey supported the hypothesis of contamination with HAV genotype 1b based on the global genotype prevalence.

CONCLUSION

This multi-state outbreak of hepatitis A required successful collaboration between public health professionals from the local, state and federal level and Costco to identify a source, recall the product and to provide PEP to those who potentially consumed contaminated product. Although the incidence of hepatitis A has declined in the US, the rise of imported foods from hepatitis A-endemic regions with less stringent controls increases the potential for foodborne spread in the US. Improving food production environmental controls and importation policy can help reduce foodborne transmission of hepatitis A. Reducing foodborne hepatitis A can be ultimately achieved through routine vaccination of persons at risk for HAV infection.

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A FISH-ASSOCIATED OUTBREAK OF *CAMPYLOBACTER JEJUNI*

Marifi Pulido, PhD; Soodtida Tangpraphaphorn, MPH and Roshan Reporter, MD, MPH

BACKGROUND

Campylobacter are gram-negative bacilli that can cause diarrhea, cramps, fever, and vomiting in humans.[1] The bacteria are typically found in poultry and cattle; ingestion of undercooked poultry and beef is the usual form of transmission. However, transmission of *Campylobacter* can also occur through contact with infected animals, the ingestion of raw milk, or the ingestion of contaminated food or water. Campylobacteriosis is a reportable disease in California, but Los Angeles County (LAC) Department of Public Health (DPH) does not routinely interview cases to obtain additional information such as type of food eaten, animal contact, etc.

On October 21, 2013, LAC DPH received a foodborne illness report stating that 25 of 140 persons became ill with diarrhea, vomiting, abdominal cramps, fever, and nausea after attending a fundraising dinner for a private LAC community club. The event was held on October 12. The LAC DPH Acute Communicable Disease Control Program (ACDC) initiated an epidemiological investigation to determine the extent of the outbreak, risk factors for the disease, and steps needed to prevent further spread.

METHODS

LAC DPH Environmental Health Services (EHS), Food and Milk Program (F&M) contacted the party on the Foodborne Illness Report (FBIR) complaint to obtain more detailed information about the menu, symptoms, and contact information for all attendees. F&M and the Environmental Health District made a site visit for inspection of the club on October 23, 2013. A partial list of ill attendees was obtained during this inspection.

ACDC created an illness and food history questionnaire which was used to interview persons eating food at the event. ACDC called fundraiser attendees and interviewed them via telephone. ACDC also contacted reported campylobacteriosis cases that resided in the same geographic area as the club. The standardized questionnaire was administered once it was determined that the confirmed case attended the fundraising event.

An outbreak-associated case was defined as a person eating at the event who either had a 1) positive laboratory test for *Campylobacter jejuni*, 2) became ill with diarrhea and abdominal cramps, or 3) became ill with diarrhea and two other symptoms (nausea, fatigue, headache, body aches, chills, or fever). An outbreak-associated control was defined as a person who ate at the event but did not get sick.

ACDC collected data in Microsoft Access and calculated frequency and distribution of symptoms among cases. An analysis of food items was also performed. All analyses were conducted using SAS 9.1 analysis software and Microsoft Excel.

RESULTS

Setting

On October 12, 2013, a fundraising event was held at an LAC community club. Approximately 150 persons attended the event. Food served at the fundraiser was prepared in the club kitchen. However, the names of persons preparing the food were not made available to ACDC or F&M. Interviews were completed on 31 attendees (21%). Twenty-one ill attendees met the case definition and seven controls were identified. Three ill persons who did not meet the case definition were excluded from the analysis.

Cases

No attendees reported illness prior to the event on October 12, 2013. The median age of cases was 68 years, with ages ranging from 49 to 77 years (Table 1). Cases were both male (58%) and female (42%). Symptoms of cases included diarrhea (100%), abdominal cramps (89%), chills (68%), body aches (53%), and nausea (47%) (Table 2). Illness onsets occurred from October 13, 2013 to October 18, 2013 (Figure 1). The average incubation period was 33 hours (range: 12-124 hours). The average duration of illness was 72 hours (range: 12-360 hours). Five cases were laboratory-confirmed and three were hospitalized. No known deaths occurred as a result of this outbreak.

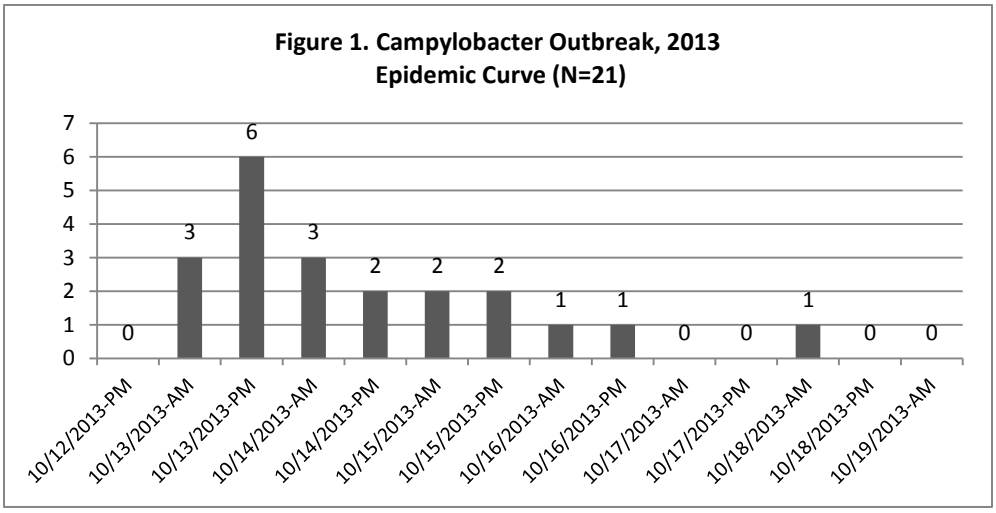

Table 1. Campylobacter Outbreak, 2013
Case Demographics (N=21)

	n	Percent
Male	11	52%
Female	10	48%
Age Group		
< 1 year	0	0%
1-4	0	0%
5-9	0	0%
10-19	0	0%
20-49	2	10%
50-74	18	86%
75+	1	5%
Median age	68 years	range: 20-77 years

Table 2. Campylobacter Outbreak, 2013
Reported Symptoms (N=21)

Symptom	n	Percent
Diarrhea	21	100%
Bloody Diarrhea	0	0%
Abdominal cramps	19	90%
Nausea	10	48%
Fatigue	10	48%
Chills	15	71%
Body Aches	11	52%
Headache	7	33%
Fever	10	48%
Fever > 102˚F	0	0%
Dizziness	6	29%
Vomiting	5	24%
Tingling	0	0%
Rash	0	0%
Median Duration= 72 hours (range: 12-360 hours)		
Median Incubation= 33 hours (range 12-124 hours)		

Food Analysis

The results of the analysis of food items are shown in Table 3. The cod was eaten by all cases and was significantly associated with illness ($p<0.001$). No other food item was significantly associated with becoming ill. The dehydrated cod was soaked in hot water, mixed with other ingredients such as potatoes, and then cooled overnight. This dish may have become cross-contaminated during its preparation or cooling/storage.

Table 3. Campylobacter Outbreak, 2013 Food Items Eaten							
	Cases (N=21)			Controls (N=7)			
Food Item	**Percent**	**n**	**N**	**Percent**	**n**	**N**	**p-value**
Cod	100%	21	21	43%	3	7	<0.001
Calamari	71%	15	21	86%	6	7	0.450
Octopus	95%	20	21	71%	5	7	0.078
Salad	76%	16	21	100%	7	7	0.154
Swordfish	71%	15	21	57%	4	7	0.483
Beans	62%	13	21	43%	3	7	0.378
Risotto	95%	20	21	71%	5	7	0.078
Potatoes	76%	16	21	57%	4	7	0.334
Walnut Roll	38%	8	21	43%	3	7	0.823
Fried Doughnut	33%	7	21	57%	4	7	0.264
Red Wine	52%	11	21	29%	2	7	0.274
White Wine	33%	7	21	0%	0	7	0.078
Water	71%	15	21	57%	4	7	0.483
Other Exposures							
Restroom use	48%	10	21	57%	4	7	0.663

Kitchen Inspection

F&M and the EHS South Bay District Office inspected the facility on October 23, 2013. The inspectors were not immediately allowed into the kitchen; the inspection began after all food preparation and cleanup had occurred. The facility was also operating without a Public Health permit and was instructed to stop preparing and serving food until a valid health permit was obtained.

DISCUSSION

The symptoms and durations reported by cases were consistent with campylobacteriosis, although the food items and incubation periods were not. The laboratory results of five cases confirmed the etiology for this outbreak. The shorter incubation periods may have been due to the advanced age of a majority of the victims. Although the consumption of cod was statistically significant, there are many factors that make that finding questionable. First, many of the club members had communicated with each other and determined that the cod was what made them sick. This bias could have led to cod consumption being overrepresented in the cases, which could then lead to the significant association observed in the analysis. In addition to this recall bias, there is the lack of biological plausibility in that *Campylobacter* infection is usually associated with raw or undercooked poultry, unpasteurized milk, or contaminated water.[1] Fish, especially dried fish, is a highly unlikely source of *Campylobacter*. The more likely scenario is that the cod was contaminated after, or during, its preparation in the club kitchen. The cod was prepared only for the fundraising event so its preparation and storage could not be directly observed by the environmental health inspectors. None of the cod was available for testing.

PREVENTION/EDUCATION

The EHS South Bay District Office held a hearing with four members/organizers of the private club. During the hearing they were informed that food at events must be from a licensed caterer. They were given Plan Check Guidelines and a Community Event information/application packet.

LIMITATIONS

In addition to the recall bias mentioned above, the study was limited by the small number of non-ill attendees participating in the study. Consequently, the control group may not be representative of the target population. The direction in which this bias skews the results cannot be assessed as it cannot be determined how different from each other the study and the actual at-risk populations were.

CONCLUSIONS

This was a point-source gastroenteritis outbreak caused by *Campylobacter jejuni* that occurred among attendees of a fundraising event at an LAC community club. Although cod was found to be associated with illness, the results are not conclusive due to the small sample size and unlikelihood of the dried fish being contaminated before it was distributed. It is more likely that cross-contamination of the cod dish occurred. No other complaints of illness have been received for this club and the outbreak appears to be limited to the fundraising attendees.

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COCCIDIOIDOMYCOSIS OUTBREAK ASSOCIATED WITH A PALEOSEISMOLOGY TEACHING SITE, LOS ANGELES COUNTY

Jessica Silvaggio, MPH; Patricia Marquez, MPH and Dawn Terashita, MD, MPH

Coccidioidomycosis is an infection caused by inhalation of airborne *Coccidioides* spp. Spores that are found in soil. The fungus grows in and is endemic to semiarid regions including the southwestern United States and Central and South America.[i] Sixty percent of infected patients are asymptomatic; however, symptomatic patients tend to experience influenza-like illness, pneumonia, and rash or skin lesions among a range of other clinical symptoms. Disseminated coccidioidomycosis is rare and occurs in approximately one in every 200 diagnosed infections.[ii] Documented exposures associated with coccidioidomycosis outbreaks include archaeological excavations, dust storms, severe drought, and earthquakes.

BACKGROUND

On November 19, 2013, the Los Angeles County Department of Public Health (LAC DPH) Acute Communicable Disease Control Program (ACDC) was notified of a possible outbreak of coccidioidomycosis by a university affiliated physician. The physician saw Patient A, a LAC graduate student, who had returned from a paleoseismologic excavation on an Indian reservation in the Cabazon region of Riverside County in May 2013. Paleoseismology involves looking at geological sediment and rocks for signs of ancient earthquakes, and is used to supplement monitoring for the calculation of seismic hazard of faults. The purpose of the fieldwork was to estimate the frequency with which earthquakes occur and consisted of digging large trenches along fault lines in dusty, dry desert. The group of six participants consisted of four students, one project lead, and a United States Geological Survey (USGS) collaborator.

METHODS

Case Definitions

A confirmed case of coccidioidomycosis was defined as a resident of LAC that met the Centers for Disease Control and Prevention coccidioidomycosis case definition and that traveled to the Cabazon region between May 1, 2013 and May 30, 2013. Clinical illness included one or more of the following characteristics: fever, chest pain, cough, myalgia, arthralgia, headache, influenza-like illness or pulmonary lesion by chest X-ray, rashes including erythema nodosum or erythema multiforme, involvement of bones, joints, or skin by dissemination, meningitis, or involvement of viscera and lymph nodes. Laboratory-confirmation of coccidioidomycosis included culture, histopathologic, or molecular evidence of *Coccidioides* species or serologic evidence of coccidioidal antibodies.

Case Finding

ACDC contacted the project lead for more information on the excavation site and group participants. A list of students and collaborators who participated in the site excavation between May 10 and May 30, 2013 was reviewed. ACDC did not receive an official list of participants who were potentially exposed on a separate site visit which occurred May 1 to May 6, 2013. Based on the interview with the index case, ACDC searched the surveillance system for additional LAC cases. ACDC made a minimum of three call attempts during the morning and afternoon hours in an effort to reach potentially exposed participants for which there was contact information. Among the four participants for whom there was contact information, ACDC discussed potential exposure with three for disease acquisition. Medical records were reviewed for three of four excavation participants.

Conference Calls

ACDC held two conference calls with the project lead and a university administrator to discuss the implications of exposure and status of the situation. Riverside County was also notified.

RESULTS

Case Definition

There were six participants in the field including four undergraduate/graduate students, a project lead, and a USGS collaborator. Three participants met the case criteria. Case A was laboratory confirmed with a *Coccidioides* antibody titer of 1:256 and a history of an influenza-like illness. Case B has laboratory confirmed with a *Coccidioides* antibody titer of 1:32. Case C tested positive and presented with a lung nodule and an antibody titer of 1:16. One participant tested negative with symptoms unknown, and two participants were not known to have been tested.

Case Characterization

LAC DPH spoke with all three cases; however, only Case A and B were formally interviewed. All three cases were exposed to the site from May 10 to May 15, 2013 and again on May 20th when they returned to the site for additional digging. Case A experienced symptoms on May 13, 2013, and was admitted to the hospital on May 23, 2013. Upon admission, Case A was symptomatic with muscle pain, shortness of breath and night sweats lasting for one week. Case B experienced symptoms on May 23, 2013 and indicated subsequently seeking care on May 26, 2013. Case B reported experiencing headache, body aches, weakness and fatigue one week after fieldwork commenced. He was also symptomatic with fever, cough, chest pain, and sputum production. Initial treatment included azithromycin and cefuroxime with no signs of improvement. Case C experienced night sweats, fever and chills. Two of the cases indicated rarely visiting the Antelope Valley, Bakersfield, San Luis Obispo and Kern County. All cases reported wearing a surgical mask while in the field but removed the mask to eat and drink. The approximate time in the field was one week usually twelve hours daily, though this varied among researchers.

All cases were male. Two of the cases were similar in age, race, education and insurance status. All cases had not been previously diagnosed and reported similar case definition symptoms. The three cases' occupation and outdoor activities overlapped. All cases reported having heard of coccidioidomycosis (Table 1).

ACDC provided the team lead with recommendations for communicating and educating students on potential risks associated with conducting fieldwork in coccidioidomycosis-endemic regions. There were no additional cases.

Table 1. Case Characteristics Aggregated (N=3)	
Demographics	**n**
Gender (male)	3
Age(median)	32
Race (white)	3
Symptoms and Hospitalization	
Range of days from exposure to onset (mean)*	5-13
Hospitalized	2
Commonly reported symptoms :	
Fever	3
Chills	3
Night sweats (> 3 weeks)	3
Headache	2
Joint pain	2
Weight loss	2
Cough	1
Shortness of breath	2
Rash	1
Muscle pain	2
Wheezing	2
Time between symptom onset and seeking care	3-6 days
Risk Factors	
Rarely visited a coccidioidomycosis-endemic region within one month of symptom onset*	2
Indicated wearing mask*	2
Common outdoor activities performed:	
Soil excavation	3
Camping	1
Hiking	1
Cycling	1
Mineral finding	1
Dust exposure during job or outdoor activities prior to illness (yes)	2
Knowledge of coccidioidomycosis	
Heard of coccidioidomycosis before diagnosis (yes)	3
Knowledge of coccidioidomycosis transmission before diagnosis (yes)	2
*Incomplete data on all cases	

DISCUSSION

ACDC conducted an investigation of three coccidioidomycosis cases among participants in a paleoseismologic excavation. Two previous outbreaks among archeology students in California have been documented in the literature.[iii,iv] Earlier studies discuss outbreaks of coccidioidomycosis associated with a common soil exposure which contained *Coccidioides* immitis.[iii] Among previously documented California coccidioidomycosis outbreaks to date among archeologic academic researchers, excavations have primarily occurred in Northern California.[iv]Clinical presentation, laboratory confirmation, and

epidemiology of the three cases confirm this was an outbreak among paleoseimologic excavation participants. All cases indicated not initially being diagnosed with coccidioidomycosis. Given the combination of symptoms, recent outdoor activity, and visits to a known coccidioidomycosis-endemic area, clinicians should consider coccidioidomycosis as a diagnosis.

The 1970s outbreaks prompted the California Department of Public Health to send recommendations to all California archeology and anthropology programs notifying them of worksite risks. [iv] Recommendations included not requiring fieldwork in coccidioidomycosis endemic regions, providing information on coccidioidomycosis, and exercising dust control measures (i.e., wearing a mask and lodging upwind of the site). These recommendations are also appropriate for paleoseismology.

The project lead supervising the earthquake fault line excavation described clearly explaining possible coccidioidomycosis exposure at the field site in the syllabus; however, field participants indicated not being notified of potential risks.

This situation underscores the importance of delivering health education materials and communicating health risks associated with conducting fieldwork or working outdoors in coccidioidomycosis-endemic regions with an emphasis on university affiliated participants and external collaborators. It also highlights the importance of wearing proper personal protective equipment (i.e., mask) for possible exposure risk and the need for physicians to explain the importance of signs, symptoms, risk factors and testing of coccidioidomycosis.[v]

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SALMONELLA MBANDAKA OUTBREAK ASSOCIATED WITH A POPULAR FAST-FOOD RESTAURANT

Roshan Reporter, MD, MPH; Marifi Pulido, PhD and Rita Bagby, RN, PHN, MSN

BACKGROUND

Salmonellosis is a bacterial disease characterized by gastroenteritis symptoms including diarrhea, vomiting, and nausea.[1] Other common symptoms include fever, headache, and abdominal pain. Humans usually become infected by eating food items contaminated with *Salmonella*, drinking contaminated water, or after coming in contact with infected animals. Infection is confirmed by culturing the organism from stool, blood, or urine. The laboratory also performs pulsed-field gel electrophoresis (PFGE) to determine whether *Salmonella* from two or more cases could have come from the same source.[2]

In March, 2013, the Los Angeles County Department of Public Health (LAC DPH), Acute Communicable Disease Control Program (ACDC) investigated a cluster of 17 *Salmonella* Mbandaka cases living in the same geographic area of SPA 2 (Region A) and indistinguishable to each other by PFGE. The onset dates of the cases ranged from January 2012 to February 2013. ACDC opened the epidemiological investigation to determine the source of the ongoing outbreak and subsequently implement procedures needed to prevent further infections.

METHODS

ACDC conducted surveillance of LAC *Salmonella* cases in Region A. ACDC reviewed case history forms completed by the LAC DPH district public health nurses. ACDC also interviewed cases using open-ended questioning and a standardized questionnaire. Responses were used to create a second questionnaire assessing case exposure to nine local restaurants and grocery sources. This survey was administered to all cases. No controls were interviewed.

Outbreak cases were defined as individuals residing in LAC who had a stool, urine, or blood sample taken between January 2012 and February 2013 which grew *S.* Mbandaka with the outbreak PFGE pattern (TDRX01.0305) on culture. The LAC DPH Public Health Laboratory (PHL) tested laboratory specimens for further identification, serotyping, and PFGE.

On March 19, 2013, LAC DPH Environmental Health Services (EHS) inspected the suspect restaurant. On March 20, 2013, ACDC and LAC DPH Community Health Services (CHS) held a joint meeting with restaurant staff to distribute stool collection vials and to discuss proper stool collection methods. During this meeting, employees filled out a standard questionnaire collecting data on illness, travel, job duties, and job history. Stool specimens were collected from employees and tested by PHL for S*almonella* and S*higella*.

RESULTS

ACDC investigated the primary *Salmonella* cluster with indistinguishable PFGE pattern in June of 2012 (n=7). Onsets ranged from January 5, 2012 to May 24, 2012. These cases were geographically clustered in Region A. Cases were interviewed with hypothesis generating questionnaires but no specific food or restaurant was implicated. ACDC continued to monitor sporadic cases from Region A reported from June 2012 to January 2013 (n=4).

PHL identified the second grouping of *Salmonella* cases in March 2013 again in Region A (n=4). This time, a particular local restaurant was mentioned by two cases, which prompted the creation of a second standardized questionnaire with a list of nine restaurants and two grocery sources. This questionnaire was administered to all primary cases identified since January 2012.

A total of 17 cases (15 primary and 2 secondary) was included in this investigation. Gastroenteritis (GE) symptom onsets for primary cases ranged from January 5, 2012 through February 19, 2013 (Figure 1). One primary case, who was tested due to a chronic urinary tract infection, did not have GE symptoms when tested so the onset date is unknown. The mean age for primary cases was 41.7 years (range: 0 to 73 years) with no predominant gender (F:M=1.1:1) (Table 1). All cases lived or had business in Region A. Primary cases reported symptoms that included diarrhea (71%), nausea (50%), fever (50%), abdominal cramps (43%), and vomiting (29%) (Table 2). The average duration of symptoms was 10.3 days (range 2 to 53 days). All 15 primary cases sought medical care, and three cases were hospitalized, but no deaths occurred. Secondary cases were household contacts of the primary cases.

Analysis of Restaurant Sources

Of the 15 primary cases, ACDC was able to obtain food and restaurant dining histories on 11 cases; two cases were lost to follow up and two cases refused to respond to the request for a second interview. All cases (100%) who responded to the follow-up interview reported eating at the same suspect restaurant (Table 3).

Environmental Health Services Inspection

EHS inspection of the suspect restaurant on March 19, 2013 found no major health and safety violations. Some minor health code violations included grease build-up on lids of food containers, soiled containers used for storage of utensils to be used by customers, peeling paint on the wall where the ice scoop is mounted, wet floors, and missing hood filters. The health inspector discussed risk factors contributing to foodborne illness and communicable disease reporting. Food facility information packets and norovirus handouts were also issued.

Restaurant Employee Meeting

ACDC and CHS met with the owner and staff of the suspect restaurant on March 20, 2013. At that time questionnaires were distributed to the employees. The employees completed the questionnaires and returned them to ACDC staff by the end of the meeting. Restaurant employees were also given stool collection vials along with written and verbal instructions on proper stool collection techniques. They were given until the next morning to bring their samples to the restaurant. The samples would then be picked up by CHS and sent to PHL. All 25 current employees submitted stool samples and completed the standardized questionnaire. All employees denied having any recent gastrointestinal illness.

Laboratory Results: Cases

The 17 *Salmonella* isolates (15 primary cases, 2 secondary cases) received by PHL were of the same serotype (Mbandaka) and had the same unique PFGE pattern, indicating these ill persons were likely infected from the same source. Mbandaka is a relatively rare serotype, less than 5% of all serotypes circulating in the United States during 2011.[3] From January 1 to April 30, 2013, the PFGE XbaI pattern associated with this cluster (TDRX01.0305) was disproportionately represented in LAC. This pattern accounted for 70% of the *S*. Mbandaka patterns in LAC but only 9.6% of all *S*. Mbandaka patterns in the national database during the 120 days prior to April 30, 2013.

Laboratory Results: Restaurant Employees

Two employees tested positive for the outbreak strain of *S*. Mbandaka with the same outbreak PFGE pattern. Both denied symptoms on their questionnaires. One of these employees was a cashier who had only been working for the restaurant for three months and did not handle food. The other employee was a manager who had worked at the restaurant during the entire time period of the outbreak and helped with the food orders when the restaurant was busy. The manager also had a gall bladder condition that predisposes one to become a carrier of *Salmonella*.[1,4-6] The spouse, daughter, and pet chameleon of the manager were also tested. The spouse and daughter tested negative. The chameleon tested positive for

a different *Salmonella* serotype (*S*. Tennessee). The remaining 23 employees tested negative for *Salmonella* and *Shigella*.

PREVENTION

The two positive employees were removed from work duties immediately. Both positive employees were treated and subsequently cleared by stool testing. There were no additional community cases of S. Mbandaka after the two employees were discovered and removed from food handling duties.

DISCUSSION

The geographic clustering of cases and 14 month range of onsets suggested that the source of the outbreak was a carrier who had some connection with each of the cases. This hypothesis was supported by the finding that a particular restaurant located at the geographic center of this outbreak was frequented by all of those *S*. Mbandaka cases who responded to the specific outbreak questionnaire. Further supportive evidence was an employee who worked through the 14 months of the outbreak and tested positive for the same *S.* Mbandaka PFGE pattern found in all the cases. In addition to having a *Salmonella* positive stool specimen, this employee denied having GE symptoms during the outbreak period. The employee had a past history of gallbladder stones. A study by Crawford et al found that *Salmonellae* can form gallstone biofilms in humans which facilitate gallbladder colonization and shedding.[4] Although the employee claims to be have been free of gallstone symptoms for at least three years prior to the outbreak, a recent study asserts that gallbladder epithelium alone may play a role in the chronic carriage of *Salmonella*.[6] The lack of GE symptoms and having a gall bladder condition is medically consistent with being an asymptomatic carrier rather than a victim of the outbreak.

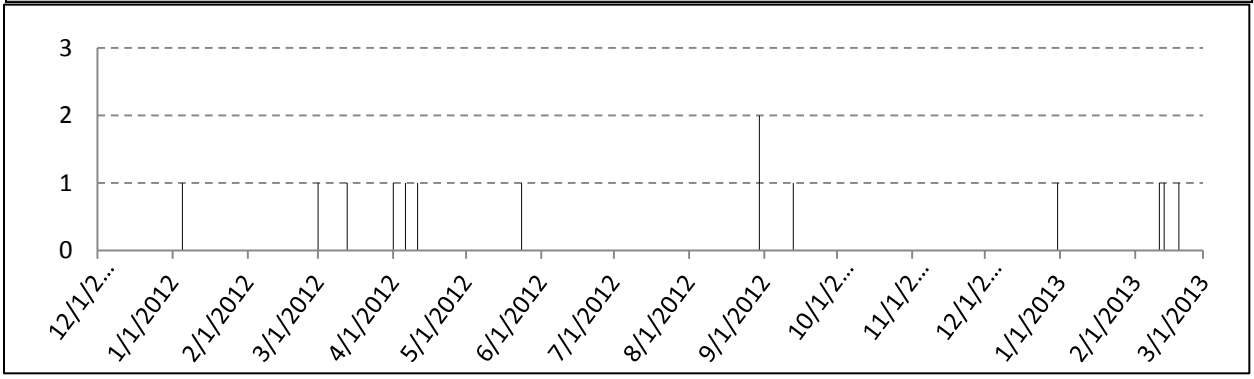
LIMITATIONS

Because a long time had passed between exposure and the interview, and many cases ate at the restaurant regularly, a food analysis was not possible. Regardless, such an analysis would most likely have yielded null results as the source case may have contaminated various foods. Additionally, some cases were not able to be contacted or were no longer willing to be interviewed. Although the lack of a control group may be viewed as a limitation of this study, this is only the case if an analysis of food items were conducted. The strength of the laboratory evidence (i.e., matching PFGE patterns) as well as 100% of cases having eaten at the restaurant is enough to implicate this particular restaurant.

CONCLUSION

A common source outbreak of *Salmonella* Mbandaka occurred among persons eating at a restaurant in LAC over a period of 14 months. The outbreak was very likely due to an asymptomatic *Salmonella* carrier working as the restaurant's manager. However, the manager may have been a carrier for years prior to the outbreak. This fact makes it difficult to determine where and how the manager became infected. No new cases have been reported as of March 2014, one year after the onset of the last known case.

Figure 1. Onset of Gastroenteritis (GE) Symptoms for Salmonella Cluster LAC (N=14*) OB2013-123



*There was one primary case with an unknown onset date for GE symptoms.

Table 1. Primary Case Demographics (N=15) OB2013-123

	n	Percent
Gender		
Male	7	53%
Female	8	47%
Age Group (years)		
Infant (<1)	1	6%
1-4	0	0%
5-9	0	0%
10-19	2	12%
20-49	7	41%
50-74	7	41%
75+	0	0%

Mean Age	Median Age	Range
41.7 years	45 years	0-73 years

Table 2. Reported Symptoms (N=15) OB2013-123 Symptom	n	Percent
Diarrhea	12	71%
Bloody Diarrhea	2	12%
Abdominal cramps	6	35%
Nausea	8	47%
Fever	8	47%
Vomiting	5	29%
Other*	1	6%
Hospitalized	3	18%
Duration (days)**		
Mean = 10.3	Median = 7	Range (2 - 53)

*One case had chronic urinary tract infection; unknown if/when the case had gastroenteritis symptoms
**Based on 12 cases (excluded 3 cases with unknown duration)

Table 3. Restaurant Exposure (N=11) OB2013-123 Restaurant Exposure	n	Percent
Suspect Restaurant	11	100%
Restaurant 2	4	36%
Restaurant 3	2	18%
Grocery 1	3	27%
Grocery 2	5	45%

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EXTENDED-SPECTRUM β-LACTAMASE *ESCHERICHIA COLI* OUTBREAK INVESTIGATION AMONG INFANTS IN THE NEONATAL INTENSIVE CARE UNIT, LOS ANGELES COUNTY, 2013

L'Tanya English, RN, MPH; Jessica Silvaggio, MPH; Patricia Marquez, MPH and Moon Kim, MD, MPH

BACKGROUND

Infants hospitalized in the neonatal intensive care unit (NICU) are often exposed to endemic pathogens in the NICU and are vulnerable to healthcare associated infections (HAI). Preterm birth, low birth weight, immature immune system and invasive devices place infants at high risk resulting in longer hospitalization and poor outcomes. Disease transmission may be vertical, from the mother to the infant or horizontal, through direct or indirect contact.[1] Sarah Tschudin-Sutter, et. al., notes that "multiple outbreaks of ESBL-producing *Enterobacteriaceae* in ICUs and increased rates of illness and death, especially in NICUs, have been reported".[2]

In November 2013, the infection preventionist (IP) at Hospital A notified the Los Angeles County Department of Public Health (LAC DPH) Acute Communicable Disease Control Program (ACDC) of three cases of culture positive extended-spectrum β-lactamase (ESBL) *Escherichia coli* (*E. coli*) among infants located in the NICU. Four additional ESBL *E. coli* positive cases were identified during the investigation. There were no deaths among the cases.

METHODS

Multiple methods were used throughout the outbreak to identify the source and prevent further transmission. A comprehensive review of case clinical, laboratory and associated records was conducted. The NICU ESBL *E. coli* background rate for 2012 and 2013 was reviewed as well as case location at the time of positive culture. Staff hand hygiene observations and infant and staff surveillance culture reports were reviewed. A comprehensive staffing analysis of physicians, respiratory therapists (RT) and nurses who provided direct care to the cases was conducted.

Multiple site investigations to gather additional information, conduct comprehensive medical record review and perform observations of NICU staff infection control practices was conducted. Outbreak management and control recommendations were also provided throughout the investigation.

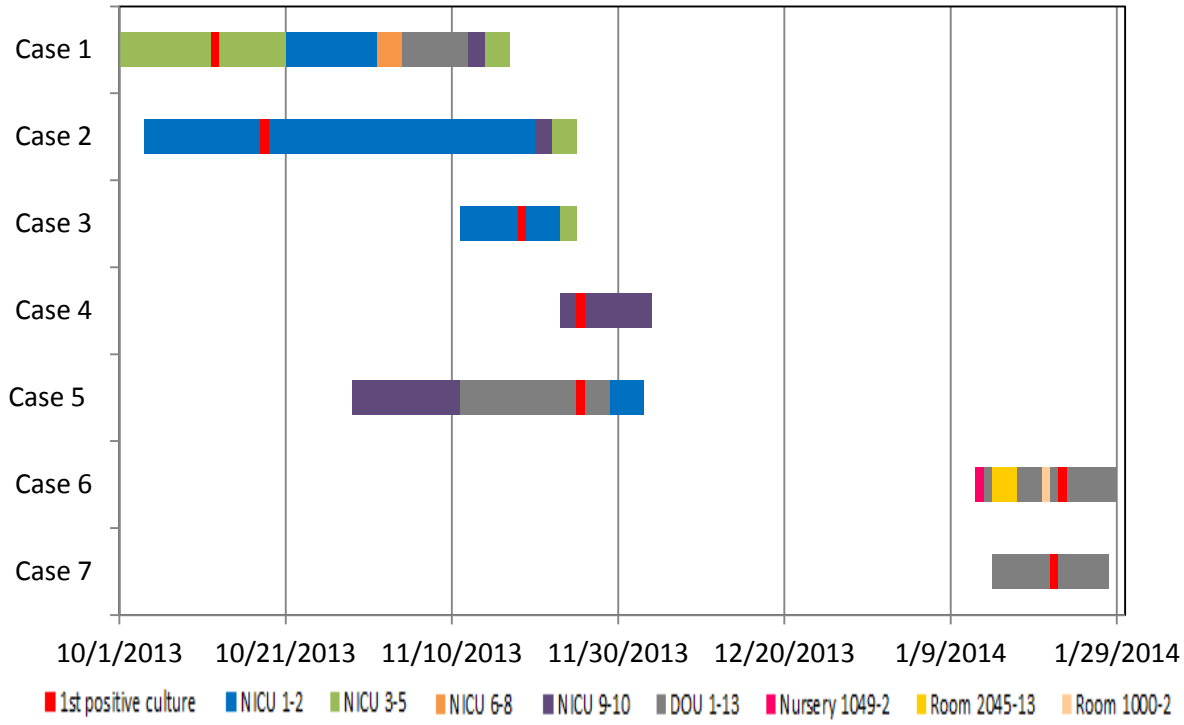
RESULTS

Cases

A case was defined as an infant hospitalized in the NICU, infected or colonized, with culture positive ESBL *E. coli*, any site, from October 12, 2013 to January 21, 2014 (Figure 1). Seven infants met the case definition. All cases were delivered at Hospital A, three by cesarean section and four by normal spontaneous vaginal delivery. Six cases were born preterm and one case was born full term. Three cases are male and four cases are female. Four cases were infected and three cases were colonized. The mean gestational age and birth weight was 29 weeks and 1617 grams, respectively. Common procedures included phototherapy (n=6), intubation (n=4) and blood transfusion (n=3). Feeding methods for all infants included total parenteral nutrition and six infants were also fed breast milk.

There were no infants with ESBL *E. coli* positive cultures in the NICU in 2012 and none from January through September 2013. The first ESBL *E. coli* positive culture was collected on October 12, 2013. The background rate of *E. coli* was reviewed from January 2012 to September 2013. During this time period the NICU averaged one positive culture per month; the pooled mean rate was 1.4 per 1000 patient days.

Figure 1. ESBL *E. coli* positive cases and NICU locations, Hospital A, Los Angeles County, October 2013 - January 2014



Laboratory Testing

All cases were ESBL *E. coli* culture positive from at least one body site that included the eye (n=2), blood (n=1), perirectal (n=2) and/or umbilicus (n=2). Six case isolates had identical antibiotic resistance patterns to ampicillin, cefazolin, ceftazidime, ceftriaxone, gentamicin, levofloxacin, tobramycin and trimethoprim/sulfamethoxazole. One healthcare worker (HCW) tested ESBL *E. coli* surveillance culture positive and had an identical antibiotic resistance pattern to six of the cases.

Strain testing by pulsed-field gel electrophoresis (PFGE) indicated that cases 1 and 5 were genetically identical. Cases 2 and 3 were genetically related to cases 1 and 5. Case 4 and the HCW were different from the aforementioned cases but genetically related to each other, and cases 6 and 7 were unrelated to each other and to the other cases.

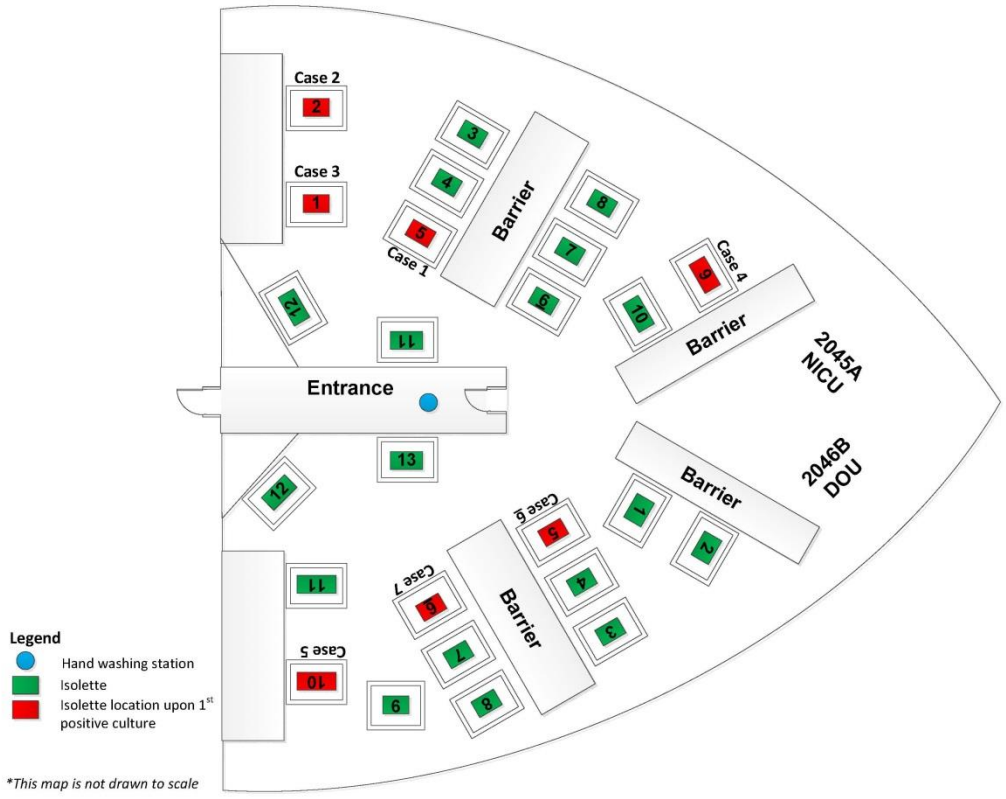
Case Location

Case location on the date of positive culture was reviewed to determine if isolette location was a risk factor for disease acquisition. The NICU has two sections and infants were frequently moved between

sections based on acuity level. Cases 1 through 5 were primarily located in the higher acuity section of the NICU while cases 6 and 7 were located in the lower acuity definitive observation unit (DOU) section. Four of seven cases became culture positive in the NICU section while three cases became positive in the DOU section (Figure 2).

Cases 6 and 7 were different from the other cases since they were less acute (e.g., had higher birth weights and experienced less reliance on central umbilical catheters), were colonized with ESBL *E. coli*, did not have as many invasive devices or procedures and were unrelated in time and space to the other cases.

Figure 2. ESBL *E. coli* positive case NICU and DOU locations, Hospital A, 2013



Staffing

A comprehensive analysis of direct care staff was conducted. There was overlap among physicians and RT as the same physicians and RTs usually provided direct care to the cases on the same days. Nursing staff overlap occurred primarily among cases 1 and 2, cases 1 and 5 and cases 6 and 7. The ESBL *E. coli* positive HCW provided care to case 4 prior to positive culture but did not provide care to cases 1, 2, 3 and 5.

Control Measures

Initial infection control measures implemented by Hospital A staff included contact precautions, infant and staff cohorting, enhanced hand hygiene education and enhanced environmental cleaning. Cleaning of

computer keyboard stations increased and equipment and surface cleaning logs were developed to track and ensure staff adherence to the enhanced cleaning regimen. An action plan was developed and environmental services (EVS) staff were re-educated on surface cleaning and disinfection.

Outbreak Management Recommendations

ACDC provided multiple outbreak management recommendations throughout the investigation, including infant and staff surveillance cultures and environmental cultures. Beginning on November 22, 2013, surveillance cultures were recommended on NICU infants. Subsequently, all new admissions to the NICU and ESBL *E. coli* negative infants were screened bi-weekly to identify continued transmission. A total of 128 infants were screened individually from December 2, 2013 to February 25, 2014. Surveillance cultures were also obtained on 67 direct care staff and one HCW was ESBL *E. coli* culture positive. All other staff cultures were ESBL *E. coli* negative. Twenty-five environmental cultures were obtained and all were ESBL *E. coli* negative.

On December 2, 2013, ACDC recommended strict cohorting of infants into three distinct and geographically separate groups with dedicated nurses and RTs designated for each cohort. Cohort 1 had newborn infant admissions never exposed in the NICU; cohort 2 had infants currently in NICU (exposed) but surveillance culture negative, and cohort 3 had infants who were ESBL *E. coli* culture positive. Physician rounds were conducted according to the three cohort groups, going from unexposed newborns to infants who were ESBL *E. coli* positive. Infants were examined in cohort 1 first, followed by cohorts 2 and 3. EVS daily cleaning was also conducted according to the infant cohort groups. In addition to strict cohorting, ACDC recommended Hospital A post an outbreak notification letter, in English and Spanish, at the NICU entrance and the nurses' station, and to provide the notification letter to all patients who deliver.

Follow-Up Investigation

Site investigations were conducted on November 25, 2013 and December 5, 2013. No lapses in staff infection control practices were noted during the unit walk-through on November 25th. On December 5th, ACDC conducted medical record review and lengthy direct observation of NICU staff infection control practices in each cohorted area. All staff complied appropriately with gowning, gloving and hand hygiene with the exception of a RT staff member who performed hand hygiene with soap and water but washed hands for only five seconds.

Hand hygiene observations were available for the months of December 2013 and January 2014. A rate was calculated for both months using The Joint Commission's composite measure of hand hygiene adherence rates,[3] which compiles multiple indications of hand hygiene opportunities into a single rate. This calculation gives partial credit for incomplete hand hygiene care and performance since healthcare workers may perform some, but not all, of the opportunities observed. The hand hygiene adherence rate for December 2013 was 89.2% and the adherence rate for January 2014 was 86.3%. The greatest deficiency in contact precautions was related to a lack of staff adherence to standard hand hygiene practices.

CONCLUSION

We document our investigation of seven cases of ESBL *E. coli* among infants hospitalized in the NICU. Cases 1 to 4 were considered infected and cases 5 to 7, identified via surveillance culture, were considered colonizations. *E. coli* is a gram-negative bacterium commonly found in the lower intestine. Few outbreaks of multi-drug resistant ESBL *E. coli* in the NICU have been reported in the literature. Risk

factors for colonization in newborns include low birth weight, duration of hospitalization, total parenteral nutrition, previous use of antimicrobial drugs and mechanical ventilation in a NICU.[2]

The exact source of the outbreak or how different strains of ESBL *E. coli* were introduced into the NICU was not able to be determined. We hypothesize that once the organism was introduced into the unit, lapses in staff infection control practice most likely led to further transmission. All cases were born at the facility and there were no case exposures outside of the NICU. There was significant overlap among nurses, RTs and physicians who cared for the cases that could account for transmission.

Based on medical record review, vertical transmission from the mother to case 1 may have occurred. The epidemiologic linkages and PFGE patterns indicated overlap in isolette locations, direct care staff, time, and a genetic relatedness among cases 1, 2, 3, and 5.

Case 4 and the positive HCW ESBL *E. coli* isolates were genetically related to each other but unrelated to the previous cases, and demonstrates possible transmission between case 4 and the HCW. Vertical transmission from the mother to infant could be a possibility. The mother of case 4 had reported having a urinary tract infection one day prior to delivery; however, records were not available to document this. The positive HCW provided direct care to case 4 on day of life (DOL) 1 and DOL 2. On DOL 3, case 4 became symptomatic and tested ESBL *E. coli* positive.

Cases 6 and 7 were both asymptomatic and identified only through surveillance culture two months after the initial five cases were identified. Molecular epidemiologic results showed that cases 6 and 7 were unrelated to the other cases.

Infant surveillance cultures were discontinued in February 2014 and there were no additional cases. As a result of the outbreak, the NICU medical administration is considering a protocol change to obtain maternal urine culture/sensitivities prior to antibiotic treatment when clinically indicated.

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VALIDATION OF LOS ANGELES COUNTY DEPARTMENT OF PUBLIC HEALTH RESPIRATORY SYNDROME USING ELECTRONIC HEALTH RECORDS

Kelsey OYong, MPH; Emily Kajita, MPH; Patricia Araki, MPH; Monica Luarca, MPH; and Bessie Hwang, MD, MPH

INTRODUCTION

Effective and valid surveillance of syndromes can be extremely useful in the early detection of outbreaks and disease trends. However, medical record validation without patient identifiers and lack of diagnoses in HL7 A08 data (messages received from hospitals containing a limited patient information update) has made validation difficult. With the rising availability of electronic health records (EHRs) to local health departments, the ability to evaluate syndromic surveillance systems has improved. In Los Angeles County (LAC), emergency department (ED) data are collected from hospitals and classified into categories based on chief complaints. The most reported syndrome in LAC is the respiratory classification, which is intended to broadly capture respiratory pathogen activity trends. To test the validity of the LAC Department of Public Health (DPH) respiratory syndrome classification, ED syndromic surveillance data were analyzed using corresponding EHRs from one hospital in LAC.

METHODS

The ED selected was part of a not-for-profit community hospital in LAC. The hospital has over 200 licensed beds and about 48,000 ED visits annually.

Records were selected from those captured by the LAC DPH syndromic surveillance systems and that were categorized as a respiratory syndrome. The number of total respiratory-classified cases was calculated by week. The study period chosen was the week of January 13, 2013 through January 19, 2013, selected for the high frequency of respiratory records during that time period. ED chief complaint data were extracted from the EHRs and analyzed by frequency. The ED chief complaint data were compared to discharge diagnoses with selected ICD-9-CM codes reflecting respiratory pathogen activity, as defined by the Centers for Disease Control and Prevention (CDC) [1]. LAC syndromic surveillance defines respiratory syndrome to include cough, shortness of breath, upper respiratory infection, difficulty breathing, fever, influenza, pneumonia, asthma, and several infectious respiratory diseases; excludes chief complaints associated with the common cold, such as stuffy nose and congestion. CDC-defined diagnoses that indicate respiratory pathogen activity include several specific infectious respiratory diseases, influenza, cough, pneumonia, respiratory abnormality, and lung abscess.

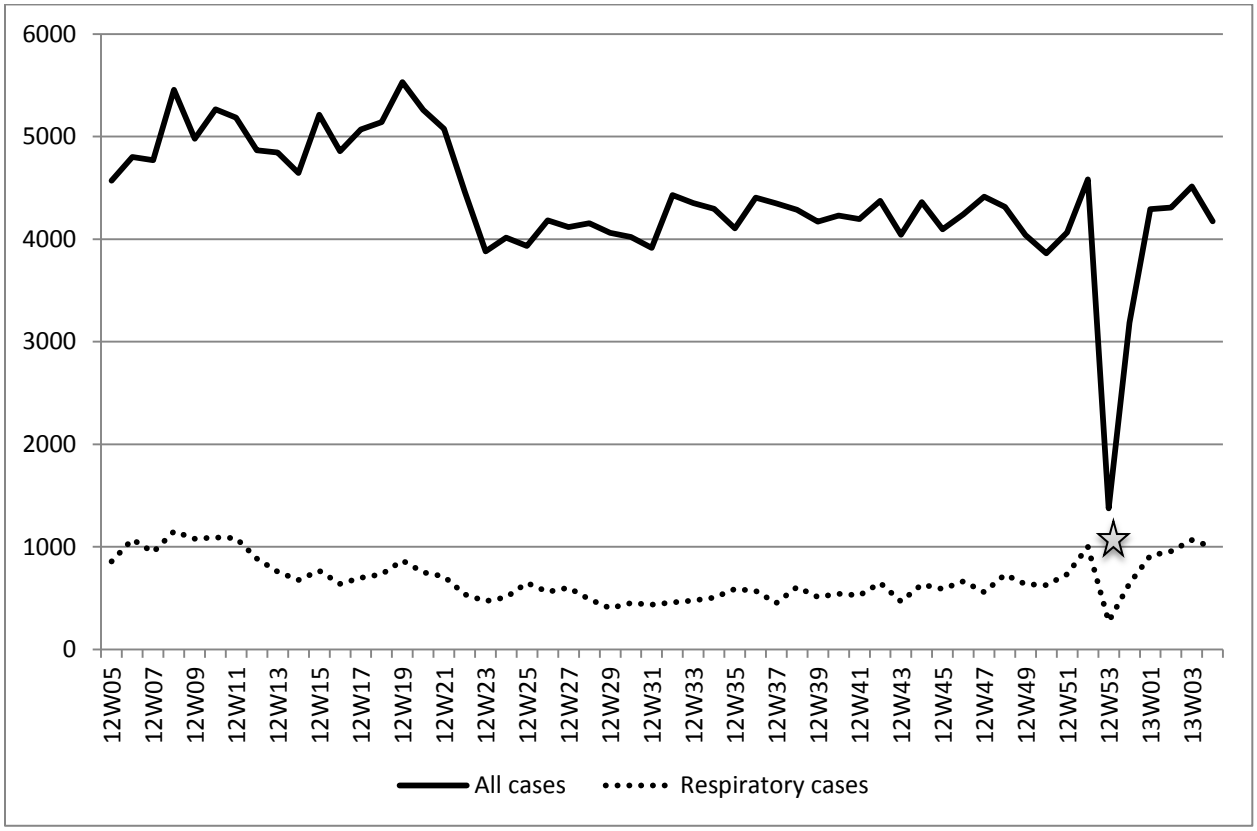
Frequencies of diagnoses and positive predictive value (PPV) of respiratory pathogen activity for each diagnosis were calculated. A kappa statistic for agreement between the LAC DPH classification and CDC-defined pathogen activity was calculated. All analyses were conducted using SAS 9.3.

RESULTS

The analysis found that weekly trends for respiratory-classified cases corresponded with number of total cases (cases classified into syndromes or not related) and exhibited seasonal variation, as shown in Figure 1. During the study period from January 13, 2013 through January 19, 2013, a total of 769 ED visits were made to Hospital A. Of those, 191 (24.8%) de-duplicated ED discharge records were categorized with respiratory syndrome. ICD-9 diagnosis code is included in 142 records (74.3%). The syndromic surveillance system classified 127 (89.4%) records as having CDC-defined respiratory pathogen activity.

The frequency and PPV for the most frequent chief complaints are shown in Table 1. Almost one-third (31.4%) of records contained a chief complaint of "fever," and the PPV of that complaint was extremely high, at 0.97. The frequencies of ICD-9 diagnoses in those records in the respiratory category are presented in Table 2. Most frequent were diagnoses of acute upper respiratory infection (26.0%), bronchitis (20.5%), influenza (15.7%), and pharyngitis (11.8%). The kappa statistic for the agreement between the LAC DPH respiratory syndromic classification and the discharge diagnosis was 0.75 (95% CI: 0.69-0.81).

Figure 1. Number of cases, all and respiratory-classified, by week, 2012-2013



☆ Decrease due to unavailability of data during Week 53 of 2012

Table 1. Frequency and PPV of chief complaints among respiratory cases, January 13-19, 2013

Chief complaint (not mutually exclusive)	Frequency	Percent of total	Positive predictive value
Fever	60	31.4%	0.97
Cough	30	15.7%	1.00
Shortness of breath	24	12.6%	0.75
Influenza	16	8.4%	0.71

Table 2. Frequency of ICD diagnoses among respiratory cases, January 13-19, 2013

ICD-9 diagnosis (not mutually exclusive)	Frequency	Percent of total
Upper respiratory infection, acute not otherwise specified	33	26.0
Bronchitis, acute	26	20.5
Influenza with other respiratory manifestations	20	15.7
Pharyngitis, acute not otherwise specified	15	11.8
Asthma, unspecified with acute exacerbation	9	7.1
Pneumonia, organism unspecified	8	6.3
Asthma, unspecified	8	6.3
Shortness of breath	7	5.5
Cough	7	5.5
Dyspnea/ respiratory abnormality, other	4	3.1

DISCUSSION

Our analysis confirmed that the number of respiratory cases by week followed established seasonal trends associated with respiratory pathogen activity. The agreement between syndromic surveillance systems and discharge diagnosis for respiratory reports is substantial (κ=0.75). This level of agreement is slightly higher than seen in other studies [2,3,4].

The calculated PPV was highest for chief complaints of “cough”, “fever,” “shortness of breath”, and “influenza.” Our chief complaint classification system can identify nearly all of cases with relevant conditions that indicate respiratory pathogen activity. A variety of different final ICD diagnoses within respiratory category were identified, with the highest frequency being diagnoses of upper respiratory infections, bronchitis, and influenza.

Some limitations in the analysis did exist. In over 25% of the EHRs, discharge diagnosis data were missing. Our analysis was only performed in one hospital and coding may differ from hospital to hospital, impacting the level of agreement. Additionally, the CDC definition of respiratory pathogen activity includes some broad diagnostic codes, such as “cough,” which may still overestimate the true prevalence of respiratory communicable disease.

Further efforts to validate other syndromic categories (e.g., gastrointestinal, neurological) and increase the power and agreement in the respiratory category are needed. However, modifying of the respiratory category may create trade-off between sensitivity and specificity, which should be considered [5]. With the growing use and availability of EHRs, the ability to validate syndromic surveillance systems is enhanced.

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USING SYNDROMIC SURVEILLANCE IN A VIRAL HEPATITIS OUTBREAK

Monica Luarca, MPH; Susan Hathaway, PHN, MPH; Emily Kajita, MS, MPH; Patricia Araki, MPH; and Bessie Hwang, MD, MPH

BACKGROUND

Hepatitis A (HepA) is a vaccine-preventable disease caused by HepA RNA virus. Transmission may occur person-to-person or by ingestion of food or water contaminated by feces of acute cases or carriers. In Los Angeles County (LAC), among adults with identified risk factors, the majority of cases are among international travelers, men who have sex with other men, and persons who use illegal drugs. Symptom of HepA include fever, fatigue, loss of appetite, nausea, vomiting, abdominal pain, dark urine, clay-colored stool, joint paint, and jaundice.[1] HepA is a reportable disease in LAC; on average there are 64 HepA cases per year.[2] All acute infections must be reported to LAC Department of Public Health (DPH) within one working day.

The Syndromic Surveillance (SS) system at LAC uses emergency department (ED) patient registration data, among other data sources, to help provide early detection of disease outbreaks and assist in monitoring of the population's health. The SS system places chief complaints (CC), the primary symptom that a patient states as the reason for seeking medical care, and diagnoses into syndrome categories and monitors for any aberrations from established baselines and thresholds.

On May 31, 2013 the LAC DPH Acute Communicable Disease Control Program (ACDC) was notified of a multistate HepA outbreak; between May 2013 and August 2013 a total of 14 confirmed outbreak cases of HepA were reported to the ACDC. Cases were linked to pomegranate seeds included in Townsend Farms Organic Antioxidant Blend, a frozen berry blend sold at Costco warehouse locations; Townsend Farms voluntarily recalled all products sold at Costco on June 3, 2013. ACDC queried its SS databases to help gauge the scope of the outbreak and detect potentially missed cases.

OBJECTIVE

The purpose of this report is to describe the complementary usage of ED data, coroner data, and poison control call center (PC) data in a multistate viral hepatitis outbreak.

METHODS

We attempted to locate HepA cases among ED visitors within the SS database by querying for matches using two methods; first, by searching for specific CCs and diagnoses from May 1, 2013 and August 31, 2013. Key words for this query included ‘Hepatitis A’, the ICD-9 code for HepA, and multiple variations and abbreviations in the spelling of these words to capture errors in data entry. Secondly, we queried the SS database for matches of the 14 confirmed outbreak cases reported to LAC DPH based on known demographic information.

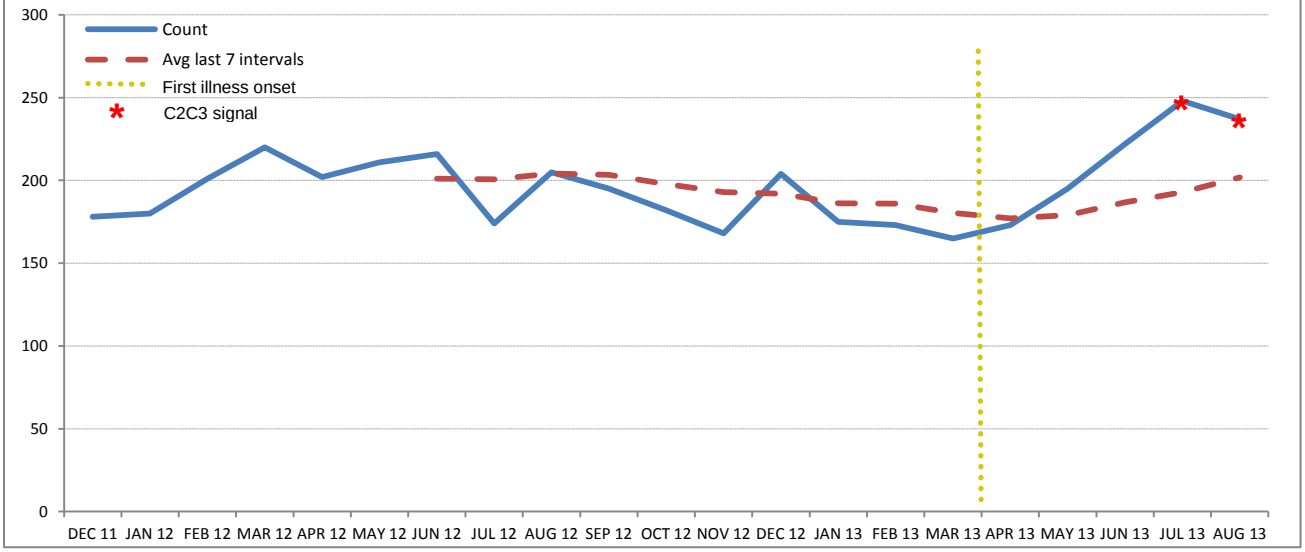
We queried coroner and California (CA) PC data for the same key words during the same time frame. Total ED visits were analyzed monthly using Early Aberration Reporting System (EARS) signal detection algorithms. All statistical analyses were conducted with SAS® version 9.3 (Cary, N.C.).

RESULTS

A total of 902 ED visits between May 1, 2013 and August 31, 2013 met the HepA syndrome definition when querying the SS database, with a high of 248 (27.5%) visits in July. Two individual visits stated “Costco hepatitis” in their CC and were reviewed, however were not confirmed cases. There was an overall increase in HepA ED visits in the months of July and August resulting in C2C3 signals (Figure1). There was no overall increase in the total number of HepA coroner deaths or in total HepA PC calls.

A total of 14 HepA confirmed outbreak cases were reported in LAC during the same time frame; seven of these reported visiting an ED (50%) of which six visited an ED ACDC currently monitors. Overall, we were able to locate three of the six cases (50%). There were no case matches in the coroner or PC databases and no new cases were identified while querying SS databases.

Figure. 1 Hep A ED visits in Los Angeles County
December 2011-August 2013



DISCUSSION

A multistate HepA outbreak was detected in May 2013 resulting in 162 confirmed cases.[3] Of the 79 cases in CA, 14 were reported in LAC. Three databases within the county's SS system were queried to determine whether there was an increase in HepA in LAC to aid in case ascertainment and to help establish tighter epidemiological links.

Ultimately, only seven of the 14 cases reported visiting an ED, and only six of those reported to an ED currently monitored by ACDC; SS could have been more successful if more cases had visited an ED. We were able to locate three of the six cases (50%) who reported to an LAC ED monitored by ACDC; however, a limitation in querying the SS databases is that the ED data are de-identified, thus, we cannot be sure that the cases we match are in fact the same person. Despite these limitations, SS is very useful in locating already known cases to collect CC and diagnosis information as long as symptoms are severe enough to warrant visits to the ED.

Alternative databases such as coroner deaths and CA Poison Control call centers have in the past proven useful in outbreak investigations that occur in unusual settings or among unique populations; however, no cases were found here. Reasons for this could include that there were no outbreak-associated deaths as HepA is a rare cause of death[4] and symptoms are too general to have been captured in the PC database. Also, since the average incubation period for HepA is 28 days (range: 15–50 days) [1] symptoms are not acute enough to warrant a call to PC. While no additional cases were found, the increase in ED visits, as well as the explicit reporting of "Costco berries" in the chief complaint, implies that the public was aware of this multistate outbreak.

This near real-time surveillance can be useful during large scale outbreaks to capture disease events or clusters that have not yet been identified. Future studies evaluating the SS system's capacity to detect

reportable disease clusters will be beneficial. As medical records transition to electronic medical records or electronic health records, we expect results to improve.

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NOROVIRUS OUTBREAK PREVENTION PROJECT
March 1, 2012 – MARCH 31, 2013

Karen Kuguru, MPA and Rachel Civen, MD, MPH

BACKGROUND

Noroviruses (NV) are the leading cause of both sporadic cases and reported outbreaks of acute gastroenteritis in the United States (US) [1, 2]. In the United States, an estimated 19-21 million illnesses, including 1.7-2.9 million outpatient visits, 400,000 emergency room visits, 56,000-71,000 hospitalizations and 570-800 deaths occur annually due to gastroenteritis illness. NV is both the leading cause of foodborne associated gastroenteritis and the most frequently reported cause of outbreaks within long–term care facilities. Approximately, one in five healthcare facility outbreaks are caused by NV [2]. Both nationally and locally, NV is the most common cause of outbreaks of gastrointestinal (GI) illness in nursing homes [2]. Skilled nursing facilities (SNFs) are the most frequently reported setting for NV outbreaks in Los Angeles County (LAC). In 2011, of 34 GI outbreaks reported from SNFs, 26 were confirmed to be due to NV, affecting 619 (80%) patients and 150 (20%) staff. Most outbreaks are associated with person to person transmission and contaminated environments [2]. These outbreaks result in increased staff work load due to acutely ill patients, intensive environmental cleaning, absenteeism among direct care and other facility staff and facility closures to new admissions by local public health.

During the spring of 2012, LAC Department of Public Health (DPH) convened the Norovirus Outbreak Prevention Working Group in response to the large number of SNF-associated NV outbreaks reported annually. The Working Group led to the development of the Norovirus Outbreak Prevention Project (NOPP), a collaborative project involving four DPH programs: Acute Communicable Disease Control Program (ACDC), Community Health Services (CHS), Environmental Health (EH), and Health Facilities Inspection Division of California DPH Licensing and Certification Program (HFs).

The goals of NOPP were to develop an educational toolkit for the prevention of NV outbreaks and provide NV outbreak prevention training to all SNFs in Service Planning Area (SPA) 3 including administrators, directors of nursing (DONs), direct and non-direct patient care providers. SPA 3 was selected because it had consistently reported the greatest number of SNF-associated outbreaks in the five years preceding the project and also this SPA had the 2nd largest number of licensed SNFs of any LAC SPA. The ultimate goal of NOPP training was to decrease the number and size of SNF-associated norovirus and other GI outbreaks and to increase the understanding of transmission and containment of NV outbreaks among all SNF staff (administrative, nursing and non-direct patient care).

This report will summarize the accomplishments of NOPP from March 1, 2012 to March 31, 2013, to include number of trainings conducted by ACDC and CHS staff and the total number of SNF line staff, DON and administrators educated at SPA 3 SNFs. Additionally, the characteristics of SPA 3's 2011-2012 GI outbreaks will be compared to the 2012-2013 GI outbreaks, which occurred during and after the NOPP intervention.

METHODS

Training and education

The norovirus toolkit was developed collaboratively by the Norovirus Working Group over a 5 month period (March-July 2012) and was launched on the ACDC web site in August 2012. The toolkit included a Microsoft Powerpoint® presentation aimed at direct and non-direct patient care providers, a fact sheet, environmental control measures, an outbreak management check list, two norovirus outbreak contact line lists (one for symptomatic staff members and the other for symptomatic residents) and additional health education information. All educational material within the toolkit were translated into Spanish. The tool kit

can be found posted on the ACDC website at
http://publichealth.lacounty.gov/acd/docs/Norovirus/NoroToolkit2012.pdf.
Seventy-eight licensed sub-acute healthcare facilities or SNFs were identified within SPA 3 as training sites by HFs. An invitation letter was sent to 78 facilities inviting them to attend one of two scheduled training sessions. Two types of trainings were provided, one training was targeted to SNF Administrators, DONs and CHS Public Health Nurses (PHNs), and the other was for direct and non-direct patient care staff. An ACDC physician conducted two training sessions for administrators and DONs and two sessions to CHS PHNs within the Monrovia and Pomona Health Districts. From October 1 to December 31, 2012, PHNs provided targeted onsite NV training to participating SNF line staff. The line staff and the DON/PHN/Administrators completed pre- and post-tests with six and 15 questions, respectively.

Case Definitions

A norovirus outbreak was defined as at least two or more NV occurrences resulting from a common exposure of which two or more were laboratory confirmed cases.

An unknown GI outbreak was defined as at least two or more occurrences of GI illness of an undetermined etiology resulting from a common exposure.

Data Analysis

The pre- and post-tests were entered into a Microsoft Access® database. A standardized outbreak investigation form and line list was completed by a PHN for each assigned outbreak. Demographic and clinical descriptions of GI outbreaks including details such as outbreak onset, duration, severity, hospitalizations, deaths, specimen collection and PHN's outbreak containment recommendations to SNFs were documented. Information from each outbreak was entered in a Microsoft Access® database. Data analysis was performed using SAS 9.2. SPA 3 GI outbreak characteristics from two norovirus seasons, September 2011-March 2012 and September 2012-March 2013, were compared. Laboratory confirmation of GI outbreaks and genotyping of norovirus strains was conducted at the Los Angeles County Public Health Lab (PHL) using polymerase chain reaction (PCR) based technology.

RESULTS

Training

Of 78 SPA 3 SNFs invited to participate in the training, 53 (68%) attended and 25 (32%) did not attend the training. A total of 136 SNF administrators and DONs and 38 PHNs attended one of the four training sessions. Of 174 participants, 173 (99%) completed the pre-test with a mean score of 13 and 174 (100%) attendees completed the post-test with a mean score of 14. SNF line staff training was provided to 60 of 78 SNFs by December 15, 2012; 18 refused or did not respond to multiple offers for training by PHNs. A total of 2264 line SNF staff received NOPP training, 1955 (86%) completed the pretest with a mean score of 5.5 and 1848 (82%) completed the post-test, with a mean score of 5.8 (Table 1).

Comparison of SPA 3 Outbreak Characteristics Pre- and Post NOPP Training

The total number of SPA 3 GI outbreaks increased by 54% from 13 GI outbreaks (9 confirmed NV and 4 unknown GI) during NV season 2011-2012 to 20 (14 confirmed NV and 6 unknown GI) GI outbreaks during 2012-2013 NV season. The total number of outbreak associated cases increased by 52 % in the 2012-2013 compared to 2011-2012 NV season, with 466 cases with 15 (3%) hospitalizations, and 306 cases with 10 (3%) hospitalizations in respective norovirus seasons. However, the average number of cases for each GI outbreak was nearly identical during both the 2011-2012 and 2012-2013 NV seasons, 24 and 23 cases, for respective NV seasons. There were no deaths due to NV or GI illness reported from any of the SNF outbreaks during the two NV seasons (Table 2).

Table 1. Norovirus Outbreak Prevention Training, Service Planning Area (SPA) 3 Skilled Nursing Facilities (SNFs), September- December 2012

	Administrators & Community Health Services (CHS)Training	SNF Line Staff Training
Completed Trainings	4	60
Total SNFs participating	53	60
Refused to participate/No Response	25	18
Number of participants:	174	2264
Number Completed Pre-test	173	1955
Number Completed Post-test	174	1848
Scores (1-15):		
Pre-test mean (range)	13.0 (5 - 15)	5.5 (1 - 6)
Post-test mean (range)	14.0 (7 -15)	5.8 (2 - 6)

The overall proportion of symptomatic staff remained the same for the two norovirus seasons, 2011-2012 and 2012-2013, respectively. Sixty-four staff or 21% of total GI illness outbreak cases were affected during GI outbreaks in 2011-2012. Of 64 SNF staff, 10 (15%) provided direct patient care, 5 (8%) were not involved in direct patient care and staffing duties were not available for 49 (77%) staff members. During the 2012-2013 NV season, 96 (21%) symptomatic staff were documented, 71 (74%) were direct patient care providers, 17 (18%) did not provide direct patient care and staffing duties were not available for 8 (8%) staff members (Table 2).

The mean and median duration of outbreaks increased during the 2012-2013 NV season compared with 2011-2012 season. The mean and median duration of GI outbreaks in 2011-2012 NV season was 8 and 6 days, respectively, compared to a mean and median of 10 and 8 days, respectively, during the 2012-2013 NV season. Reviewing the duration of outbreaks in SNFs outside of SPA 3, the 2011-2012 mean and median duration of SNF outbreaks was longer, 9 and 8 days, compared to 2012-2013 with 7 and 6 days (data not shown). The mean and median time to report an outbreak to LAC DPH decreased in SPA 3 in 2012-2013 compared to 2011-2012, from 4 and 3 days, respectively, compared to a mean and median of 3 days each for NV season 2012-2013 (Table 2).

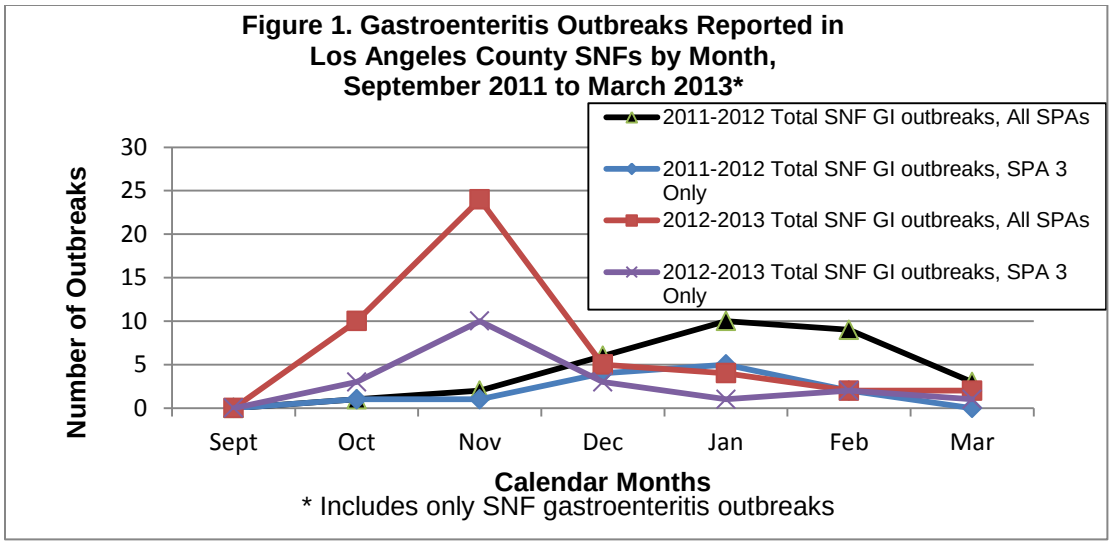
The peak report time for SNF outbreaks was two months earlier in 2012-2013 compared to 2011-2012 in SPA 3 and all SNF reported outbreaks within LAC. Reviewing SNF outbreak reports from all SPAs to DPH during the 2011-2012 season, the outbreak season peaked in January 2012 with 10 (32%) outbreaks and declined in March 2012 with 3 (10%) outbreaks. This outbreak epidemiologic trend was also consistent with the five year prior season (data not shown). For 2011-2012 norovirus season, SPA 3 followed a similar trend as the overall LAC SNF GI outbreaks with one outbreak reported in October 2012 and peak outbreak reports in January 2012 with 5 (39%) and declines noted in February 2012 with 2 (15%) outbreaks. In contrast, during the 2012-2013 NV season, community and SNF GI outbreaks were initially reported in October 2012 with 10 (21%) outbreaks and peaked in November 2012 with 24 (51%) and declined in December 2012 with 5 (11%) outbreaks followed by January 2013 with 4 (9%), February 2013 with 2 (4%) and March 2013 with 2 (4%) outbreaks. SPA 3 followed a similar trend with the first SNF outbreak reported in October 2012 followed by a peak in November 2012 with 10 (50%) and declined in December 2013 with 3 (15%) outbreaks. (Figure1).

More strain typing was completed on laboratory confirmed NV SNF outbreaks in SPA 3 during 2012-2013 compared to 2011-2012. Of nine NV outbreaks in the 2011-2012 norovirus season, 1 (11%) was identified as the GII.1 strain type, while 8 (89%) outbreaks were not strain typed. Strain typing was

completed on all 14 confirmed NV outbreaks in 2012–2013 SPA 3 SNFs, 12 (86%) were identified as the GII.4 Sydney strain, one (7%) was GII.4 New Orleans strain and one (7%) was GI.6A strain.

Table 2. Characteristics of SNF gastrointestinal illness (GI) Outbreaks, SPA 3, September 2011-March 2013

Outbreak Characteristics	Norovirus Season 2011-2012 N (%)	Norovirus Season 2012-2013 N (%)
Number of GI outbreaks reported in SNFs	13	20
Norovirus Confirmation and Strain Type:		
Norovirus (NV)	9 (69)	14 (70)
Unknown GI	4 (31)	6 (30)
Total NV outbreaks available for genotyping:	9	14
GII.4 Sydney	0	12 (86)
GII.4 New Orleans	0	1 (7)
GII.I	1 (11)	--
GI.6A	0	1 (7)
Unknown Strain	8 (89)	--
Patients with Illness:		
Total affected in the outbreak	242	370
Hospitalized	10	15
Died	0	0
Staff with Illness:		
Total affected in the outbreak	64 (21)	96 (21)
Direct Care	10 (3)	71 (15)
Non direct care	5 (2)	17 (4)
Unknown staffing duties	49 (16)	8 (2)
Total Patients and staff with illness	306	466
Average Number of cases/outbreak	24	23
Duration of outbreak (days):		
Mean	8	10
Median	6	8
Range	2-27	0-30
Days from symptom onset to report date:		
Mean	4	3
Median	3	3
Range	0-9	0-14



DISCUSSION

In the spring of 2012, LAC DPH convened the Norovirus Outbreak Prevention Working Group with the goal of enhancing training for SNF associated viral GI outbreaks (specifically norovirus), develop a toolkit for norovirus outbreak prevention and provide training for SNF nursing directors, administrators and direct and non-direct patient care staff. SPA 3 was targeted for NOPP because during previous NV seasons, this SPA reported the greatest number outbreaks and total cases of GI outbreaks in SNF compared to all other SPAs. Our working hypothesis was that enhanced training of supervisorial and line staff would lead to decreased outbreak reports and total number of cases per outbreaks. However, during the 2012-2013 norovirus season, SPA 3 reported an even greater number of GI outbreaks and total cases of GI illness compared to the 2011-2012 NV season. There are various reasons to explain these findings. It is likely that increased contact with our health department through onsite PHN training of line staff and administrators caused a surveillance bias and led to an increased understanding of the importance of outbreak reporting and more timely and thorough completion of investigation reports. However, we believe that the most important reason for this rise in cases and reports was the appearance of a new norovirus genotype, GII.4 Sydney.

In January 2013, MMWR “Notes from the Field” reported the emergence of a new norovirus strain, GII.4 Sydney, identified in Australia in March 2012, as the norovirus strain responsible for over 50% of US gastroenteritis outbreaks reported to Centers for Disease Control and Prevention by December 2012 [3]. This communication also noted that norovirus GI outbreak activity across the entire US commenced in October 2012, approximately three months earlier than previous seasons. In LAC, genotyping studies of NV outbreak strains in 2012 and 2013 demonstrated the presence of GII.4 Sydney strain in both SNF and community based GI outbreaks beginning in October 2012. For the 2012-2013 NV season, peak outbreak activity was identified in both SNF and community GI outbreaks in November 2012 in both SPA 3 and other SPAs, two months earlier than norovirus/GI outbreak seasons from 2008 to 2012, where GI outbreaks predictably peaked between January and February. This pattern was also identified from 2009-2012 nationally in both foodborne and non- foodborne NV outbreaks through the National Outbreak Reporting System [1]. Our time table of NOPP training activities during the fall of 2012 was based on annual peak NV patterns of the past 4 to 5 years. In contrast to prior years, both community and SNF-associated GI outbreaks in 2012-2013 started increasing in October 2012 and peaked by November 2012 (Figure1). Of 20 SPA 3 GI SNF outbreaks reported during 2012-2013 NV season, NV strain typing confirmed 12 were likely due to GII.4 Sydney, one GII.4 New Orleans and one GI.6A. The arrival of this new genotype during the SPA 3 enhanced training period most likely contributed to the increase in SNF-associated outbreaks and thus impacted the effect that the NOPP might have had in decreasing the number and size of outbreaks.

It is known that SNF patient care staff can be impacted by norovirus outbreaks. The Norovirus Outbreak Prevention toolkit provided an important addition to the outbreak line list by categorizing ill staff by their patient care roles, direct versus non-direct patient care, i.e., housekeeping. In both NV seasons 2011-2012 and 2012-2013, 21% of total outbreak cases were SNF staff members. Therefore, NV outbreaks are an important occupational health risk for SNF staff. Although direct patient care staff were more frequently ill, 71 (82%), there were 17 (18%) ill non-direct care staff reported during the 2012-2013 NV season. Non-direct patient care staff may have acquired NV infection by not utilizing proper personal protective equipment (PPE) during cleanup or entrance to the patient care environment. The contribution of SNF staff to amplification of outbreak and NV transmission within a SNF has not been well studied. It is possible that both patient care and non-patient care staff members worked different shifts in multiple facilities and contributed to the spread of NV disease at more than one SNF. More data collection of ill staff members over a longer time period will be necessary to better assess their contribution to the spread of viral GI illness and if guidelines to prevention are adequate and have compliance. Although we were not able to get any norovirus stool specimens to specifically demonstrate that staff members had the GII.4 Sydney strain, staff symptom onsets of illness within each outbreak linked them to each individual SNF outbreak. It is clear that education on norovirus prevention and environmental cleaning will need to be consistently targeted at both patient care and non-direct patient care staff to prevent illness among SNF staff.

There are important limitations of this investigation that need to be considered.

(1) Due to less frequent strain typing during NV season 2011-2012, we cannot definitely say that GII.4 Sydney strain had not arrived in LAC. However, the limited strain typing available from the 2011-2012 NV season in LAC SNFs support that GII.4 New Orleans was the predominant NV strain in 2011-2012.
(2) Ideally, NV stool specimens should have been collected on SNF staff members impacted by SNF outbreaks.
(3) The training schedule was presented in SPA 3 from January to March based on the usual past peak timing of norovirus season and we were not able to predict that the norovirus season would start much earlier in October of 2012.

To assess the effectiveness NOPP training and utilization of toolkit, norovirus outbreaks will need to be closely monitored in future seasons. Additionally, viral genotypes will need to be studied for emergence of new genotypes that predictably lead to an increase in cases among SNF patients and staff. Possible without the NOPP, the number of cases in outbreak could have been larger. It is also possible that decreases in outbreak reports and duration of outbreaks will be more apparent in the future as communication between SNF directors, line staff and PHNs encourage more prevention and containment efforts for NV within SNFs and the genotype of the circulating NV strains remains stable.

REFERENCES

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