CHAPTER X: SUMMARIZING THE INVESTIGATION

IMPORTANT RESOURCES

EPIDEMIOLOGY PROGRAM
(Bureau of Infectious Disease and Laboratory Sciences)
617-983-6800 (Regular and Emergency Number)

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When an investigation is complete, the final responsibility is to provide written documentation of events. While this chapter focuses on a report written for a more complex outbreak, even single complaints should be documented as completely as possible. The single complaint must always be regarded as the possible first indication of a larger problem.

A. The Report

The report documents what happened in a foodborne illness investigation. It is a public record and must be objective, accurate, clear, and timely. Detail in the document should reflect the complexity of the incident under investigation. A single complaint might only require a *Foodborne Illness Complaint Worksheet* with a list of action steps and any follow-up.

A more complicated occurrence, such as a large outbreak, might involve people outside your local jurisdiction and require a more comprehensive report. It may be necessary to enlist all involved parties when writing a final report. It is the responsibility of the local board of health (LBOH), however, to recruit Massachusetts Department of Public Health (MDPH) personnel or others to assist in completion of the report.

B. Purpose of the Report

Whether the report is being written in response to an outbreak or a single complaint, complete documentation is important for the following reasons:

1. A document for action. In some cases, control and prevention measures will only be instituted in response to a written report. Until an outbreak is documented and summarized in a formal "outbreak report," it is easy for the implicated establishment operator to shift responsibility. The document contains the "official" findings. It should be used to refute rumors and speculation.

2. A record of performance. A well-written report documents the magnitude of health problems and justifies program activities. A report clearly states events that occurred and the process that was followed. It should include all steps undertaken by everyone involved. The person writing the report will need to gather that information. The comprehensiveness of the outbreak report should reflect the complexity of the investigation. This accurately documents events and also clearly illustrates staffing resources required to undertake the investigations.

3. A document for potential legal issues. An investigative report written by health professionals must be written objectively, honestly and fairly. Information in these investigations is frequently used in legal actions. Thus, it is very important that a record exists that accurately documents events in a timely manner to aid in any legal investigations that might ensue.

4. An enhancement of the quality of the investigation. The process of writing a report and viewing the data in written form may result in new insights. It could precipitate new questions to be answered before a conclusion is reached. The more investigations and outbreaks one writes up, the better the understanding of process and results.

5. An instrument to present control and preventive measures. The primary reason to undertake an investigation is to control and prevent disease. The written report is an official medium to present control and preventive measures, and perform needs assessments. One may identify new trends, introduce new regulations

or policies, identify training needs and reinforce existing regulations. When the report is presented to the owners and managers, encourage them to use it as a catalyst for change. This document is an educational tool and may help to prevent the same problems from reoccurring. For example, operators who have been educated about the availability and safety of a pasteurized egg product will probably choose that over pooled whole, shell eggs.

C. Outbreak Report Format

There are a variety of ways to compile the information obtained during an investigation into a professional, understandable and usable document. Below is the standard outline used to write an outbreak report. It can be modified to reflect the complexity of any size outbreak. Three outbreak report examples can be found at the end of this chapter. Each one represents a different level of complexity.

Even if you do not get the opportunity to compile a complex "outbreak report," you might be the recipient of one, if a large outbreak occurs in your jurisdiction. It would be helpful for you to be familiar with the following format and understand what information is contained in each section. It will then be easier for you to adopt any or all of the sections for use when responding to, and documenting, smaller scale incidents.

Figure 10-1: Foodborne Illness Outbreak Report Outline

I. Summary
II. Introduction
III. Background
IV. Methods
    a. Epidemiologic
    b. Environmental
    c. Laboratory and Clinical
V. Results
    a. Epidemiologic
    b. Environmental
    c. Laboratory and Clinical
VI. Discussion
VII. Recommendations
VIII. References
IX. Acknowledgments
X. Supporting Documentation

Summary. The summary should consist of a paragraph or two that provide the reader with an overview of the investigation, the Who, What, Where and When of the outbreak. It should describe what caused the outbreak or the causal hypothesis based on the evidence.

Introduction. Include the specific events that led to the investigation:
a. How the outbreak was first reported,
b. Steps undertaken to confirm its existence, and
c. All who assisted in the investigation.

Background. Background information is important. This section identifies the type of establishment involved in the outbreak, such as a take-out restaurant, banquet facility, caterer, fast food establishment, retail store, etc. Also include whether the establishment is part of a national chain, a commissary, a dormitory, or a buffet where attendees are likely to eat multiple foods. In this section discuss the capacity for the food service operation, which may help to determine the possible extent of the outbreak.

Methods.

a. Epidemiologic. Explain how cases were defined. For example, even if you are investigating an outbreak of *salmonella*, you are probably not confining yourself to only laboratory confirmed cases. Does a case have to experience diarrhea or is abdominal cramping sufficient? The issues should be determined and explained in detail. Also describe how cases became known, questions you asked, and how asked. Include descriptions of interview techniques and copies of questionnaires or surveys if used.

b. Environmental. Clearly outline the number and kinds of environmental investigations that occurred and who conducted them. Was a HACCP risk assessment conducted of suspect foods as well as physical facility inspections? Were there any tracebacks of food products?

c. Laboratory and Clinical. Discuss any analyses performed. It is important to note what kinds of and how many specimens were submitted for laboratory analysis. Was food available for testing? Did cases submit stool specimens or other clinical specimens for analysis? Were food handlers required to submit stool samples for testing? Note where the specimens were sent, what kinds of analyses were performed and who completed the testing. This could involve private, MDPH or federal laboratories.

Results. In the previous section, you outlined what steps you took to investigate the outbreak. This section pertains to what you discovered. These results can be presented in tables, graphic figures and/or text:

a. Epidemiologic:

- Number of questionnaires distributed and returned
- Number of people fitting the case definition
- Symptoms experienced by cases
- Duration of symptoms
- Incubation period
- Food or meal-specific attack rates
- Statistical significance of foods eaten
- Epidemic curve of the outbreak
- Relationships among cases, if any

b. Environmental:

- Results of any HACCP risk assessments conducted
- Results of the physical facilities inspected with violations noted
- Results of any food tracebacks

c. Laboratory and Clinical

- Culture or other laboratory results on food handlers, patrons, or other individuals connected to the outbreak
- Results on foods tested

Discussion. This section is where all aspects of the investigation are brought together and a conclusion is drawn. Not all outbreaks have a resolution. In fact, it is rare when everything comes together and a cause can be definitively determined. In most cases, there will be enough evidence to present a plausible hypothesis. Be clear and present a detailed explanation of what has contributed to the conclusion.

Recommendations. This is the opportunity to educate. Be detailed because these recommendations hopefully will be read by many people in the establishment that was investigated. The establishment has a vested interest in following the suggestions. If the outbreak has been large and disruptive, the establishment will not want it to reoccur. In addition to listing general recommendations on good food handling procedures, include specific recommendations that address what might have been overlooked in this particular outbreak, such as attempting to transport food long distances at inadequate temperatures.

References. If you have referenced information in your conclusion, you should include those references here. If you are not citing any references, you can either use N/A or delete this section and label the next section as Section VIII.

Acknowledgments. In the spirit of cooperation, it is proper to thank those who assisted in the investigation. This might include health care personnel, the food employees and/or management of the establishment or other local or state officials.

Supporting Documentation. When compiling the report, attach copies of all items that are relevant. These would include:

- Inspection reports
- Blank samples of the surveys or questionnaires
- Letters to management
- Menus
- Copies of posted notices
- Food testing results
- Foodborne illness worksheet(s) without names or other personal identifiers

When compiling material, be aware of confidentiality issues. Information that can lead to the identification of individual cases should not be included in the outbreak report. The name of the establishment under question is part of the public record and can be disclosed. Data that cannot be used to identify individuals can be present. People cooperate in investigations on the basis of protected confidentiality and this should be respected.

D. Distributing the Report

Copies of the report should be made available to all parties involved in the investigation. This would include, but not be limited to, the owner and/or managers of the establishment, the MDPH, and any other local or state agencies affected by, or involved in, the outbreak or the investigation. The MDPH will always distribute the outbreak report to the involved LBOH, but may request that the LBOH then distribute the report to the establishment involved.

References:

Bryan, F. *Guide for Investigating Foodborne Disease Outbreaks and Surveillance Data*, U.S. Department of Health and Human Services, CDC. Atlanta, Georgia, 1981.

Council to Improve Foodborne Outbreak Response (CIFOR). *Guidelines for Foodborne Disease Outbreak Response*. 2nd edition. Atlanta: Council of State and Territorial Epidemiologists; 2014. Page 142.

Attachments:

Attachment 10-1: Example #1 Outbreak Report
Attachment 10-2: Example #2 Outbreak Report
Attachment 10-3: Example #3 Outbreak Report

MDPH Bureau of Infectious Disease Prevention, Response and Services

Memo

TO: The File

FROM: Writer of the Report

DATE: May 29, 2009

RE: Shiga Toxin-Producing *Escherichia coli* (STEC) outbreak – Establishment A, Town B WG# XXX-XX-XXX

I. Summary
In August 2006, the Pulsed-Field Gel Electrophoresis (PFGE) Laboratory at the Hinton State Laboratory Institute (HSLI) informed the Epidemiology Program of a cluster of five matching cases of non-O157 shiga toxin-producing *Escherichia coli* (STEC). Case investigation revealed Establishment A in Town B as a possible source of exposure in four out of five of the cases. Inspection of the establishment revealed that hygiene practices appeared adequate and there were no obvious sources of contamination. All food and water samples tested were negative for bacterial enteric pathogens. An animal stool sample tested positive for STEC, but was not a PFGE match to the human isolates; however, it is likely that human exposure to STEC occurred at the establishment in light of the common exposure of all five cases. This outbreak highlights the need for adequate education regarding the increased potential for disease transmission where animals are present.

II. Introduction
On August 9, 2006, the PFGE laboratory at the HSLI informed the Epidemiology Program of a cluster of five cases of non-shiga toxin-producing *Escherichia coli* that matched using two different enzymes. The isolates were from four Massachusetts residents and one New Hampshire resident with an age range from 5-14 years. Case investigation revealed Establishment A in Town B as a possible common exposure source in four out of five of the cases.

Epidemiologists contacted the Town B LBOH and the Massachusetts Department of Public Health Food Protection Program (FPP) on August 28, 2006. The Massachusetts Department of Agricultural Resources (MDAR) was also contacted to assist in the investigation.

III. Background
Establishment A is located in Town B, MA. Visitors can hand-pick fruits including strawberries and blueberries. There is also a petting zoo on the premises with goats, sheep, bunnies, chickens, and ducks that visitors can hand feed. There is also a small market on the grounds selling farm produce and an ice cream stand.

IV. Methods

A. Epidemiologic

Case Report Forms (CRFs) from the five cases of STEC were reviewed for common food or activity exposures that could have occurred while visiting the establishment.

B. Environmental

A site visit to the establishment was conducted by an Epidemiology Program epidemiologist, the State Public Health Veterinarian and an MDAR representative on August 31, 2006.

C. Laboratory

Several environmental samples were collected for bacterial pathogen testing during the establishment site visit. Strawberries and blueberries were sampled from the farm's produce market. Animal stool samples were collected from the three pens containing sheep and goats. Each pen had a shed for the animals; two pens contained goats only and one contained a mix of sheep and goats. Fecal samples from multiple locations within each pen were taken. Fecal pellets from outside the shed were combined and those from inside the shed were combined resulting in two pooled samples from each pen, for a total of six samples. Water from the irrigation pond was collected. All samples were brought to the HSLI food and enteric labs for testing.

V. Results

A. Epidemiologic

Case investigation revealed Establishment A in Town B as a possible common exposure in four out of five of the cases. Of the five matching cases of STEC, two cases picked and ate blueberries and two cases ate strawberries (one hand-picked by the case, the other ate strawberries picked by a neighbor). Three of four cases with establishment exposure also reported petting goats at the petting zoo. Visits to the establishment occurred from July 1st to August 4th.

B. Environmental

Inspection of the establishment revealed that hygiene practices appeared adequate and there were no obvious sources of contamination. The owners clarified that blueberries were irrigated with filtered water that runs through underground tubing. Strawberries were irrigated using overhead spraying with unfiltered water from an outdoor irrigation pond. It was noted that there were handwashing stations near the petting zoo but no obvious signage encouraging handwashing. There were also picnic tables adjacent to the petting zoo.

Although the establishment reported that their goats tested negative for pathogenic strains of *Escherichia coli* in June 2006, two juvenile goats died of diarrheal illness the first or second week of July 2006. The ill goats reportedly were isolated in a separate pen (apart from the petting zoo) as soon as symptoms began.

C. Laboratory

The strawberries, blueberries, sheep stool and irrigation water were negative for enteric pathogens. One goat stool sample tested positive for STEC, but was not a PFGE match to the human isolates. All samples, including five cases and the goat sample, were sent to the CDC for confirmatory testing and subtyping. *Escherichia coli* O26:H11 was found in all human isolates. The goat isolate was positive for *Escherichia coli* O with an undetermined subtype.

VI. Discussion and Recommendations

STEC was isolated from both goat stool and from visitors to the establishment and while the animal and human isolates did not match by PFGE, it is likely that human exposure to STEC occurred at the establishment in light of the common exposure of all five cases.

This outbreak highlights the need for adequate education regarding the increased potential for disease transmission at petting zoos. STEC outbreaks can be of particular concern at petting zoos because of the significant amount of public contact with livestock that occurs. Those animals may be carrying any number of zoonotic gastrointestinal pathogens, including STEC. Children are a special cause for concern because they may have a higher frequency of contact with the animals and may not be careful about hand hygiene. In this situation, there was additional concern caused by having an eating area that was directly adjacent to the petting zoo, presenting a further risk for accidental fecal-oral transmission from the animals. As a result of this outbreak and investigation, precautions were taken to prevent infection. For example; additional signage was posted near the handwashing stations that were already set up near the petting zoo, an additional fence row was constructed to prevent people from having direct contact with the animals, and picnic benches were moved further away from the animals and designated as an 'eating only area'.

Because of the delay that is an inevitable result of laboratory testing, pinpointing the source in these kinds of outbreaks may not be possible, especially because healthy livestock often carry multiple human enteric pathogens, but may shed them only intermittently. Increasing public awareness of the risks associated with close proximity to animals and hand-to-mouth contact can reduce the incidence of similar outbreaks in the future.

VII. Acknowledgments

Thank you to the Town B Board of Health and the Department of Agricultural Resources for their role in this investigation.

Attachment 10-2: Example #2 Outbreak Report

MEMORANDUM

TO: The File

FROM: Writer of the Report

DATE: May 9, 2014

RE: Salmonella Montevideo and Oranienburg PFGE Cluster- Establishment B, Town C, MA, March 2013, WGFIC # YYY-YY-YYY / MAVEN ID #: XXXX

I. Summary

In March 2013, *Salmonella* Montevideo infection was identified among employees and patrons of Establishment B in Town C using Pulsed field gel electrophoresis (PFGE) on isolates from clinical specimens. The PFGE pattern of *S.* Montevideo, JIXX01.0310, was unique to Massachusetts with six diners and four employees testing positive for the organism between March 10 and April 5, 2013. No individual food product was implicated in patron interviews. In the course of testing, one foodhandler and one patron were found to have *Salmonella* Oranienburg infections. Food preparation practices may have provided multiple opportunities for contamination by *Salmonella* positive foodhandlers. In response to the outbreak and establishment conditions, the facility voluntarily closed on March 28, 2013 for thorough sanitation, consulting, and town inspection. Establishment reopened on April 5, 2013, following a repeat town inspection.

II. Introduction

On Thursday March 21, 2013, Town C's public health nurse (PHN) notified the Epidemiology Program (EPI) of a possible gastrointestinal illness cluster identified during routine *Salmonella* case follow-up. The case's daughter, acting as a translator, informed the PHN that up to 15 family members and friends had become ill after a large gathering at Establishment B. Late that same day, the MDPH Food Protection Program (FPP) received another complaint about the restaurant from an unrelated Town D resident and the Town E Board of Health (BOH) stated they had received a complaint from a Town D resident. Two of these cases were known to have *Salmonella* species infection and another had pending stool cultures at a local hospital.

The Working Group on Foodborne Illness Control (WGFIC), in conjunction with the Boards of Health of Towns C, D, E and F began an investigation.

III. Background

The Establishment is a popular sit down restaurant and banquet hall in Town C that serves traditional food from a large menu. Cooked dishes include seafood, chicken, beef, and pork prepared a variety of ways and uncooked food includes several salads. The banquet menu is a selection of dishes from the restaurant menu, served family style, with fruit, cheese, dessert, teas, and coffee. Up to 130 people can be accommodated for banquets, along with more seating in the restaurant.

The PFGE lab found the *S.* Montevideo isolates from this cluster indistinguishable from another County D *S.* Montevideo cluster, consisting of four cases, from 2012. The previous cases had been investigated in September of 2012, but no common source identified. Due to PFGE and geographic similarities, the 2012 *S.* Montevideo cluster interviews were reviewed to identify commonalities with the 2013 cases.

IV. Methods

A. Epidemiologic

A case was defined as a person diagnosed with laboratory confirmed S. Montevideo infection with the PFGE pattern combination JIXX01.0310. The local BOHs were asked to document in MAVEN the clinical presentation, food and travel history, and whether cases had recently eaten at Establishment B. Relevant food and clinical information was compiled and analyzed in Microsoft Office Excel 2003.

The original family party was not available for interviews which prevented MDPH and the LBOH from conducting interviews of the attendees of the family

B. Environmental

On March 28, 2013, the FPP requested from the Town C BOH a list of employees at the establishment and employee schedules.

On March 29, 2013, investigators from the Town C BOH and FPP conducted an inspection at the establishment.

On April 4, 2013, the Town B BOH conducted a re-inspection at Establishment B.

C. Laboratory

1. Clinical

A total of 30 stool specimens were collected and tested at the Hinton State Laboratory Institute (HSLI) from 15 employees of Establishment B. Samples positive for *Salmonella* species were serotyped and tested by the PFGE laboratory.

2. Food

No food specimens were collected for testing.

V. Results

A. Epidemiologic

Ten individuals tested positive for the outbreak strain of *S.* Montevideo. Four of the cases were foodhandlers at the implicated restaurant and the remaining six were from the Town of D (2), Town of E (1), the Town of F (1), the Town of G (1) and the Town of H (1). The mean age of the cases was 36 years; 50% were male. Of the six non-foodhandler cases, five were interviewed and of those, three reported eating at the establishment between March 8 and March 12, 2013. The onsets of the six cases occurred between March 10, 2013 and March 23, 2013 (Figure 1). None of the foodhandlers reported gastrointestinal symptoms.

In addition to the *S.* Montevideo cases, one foodhandler who tested negative for S. Montevideo tested positive for *Salmonella* Oranienburg which matched by PFGE to isolates from a case of S. Oranienburg infection

identified in a Town H resident who had reported eating at the establishment on March 30, 2013, prior to becoming ill.

During the course of the investigation a case of *Salmonella* Group C was reported in an out of State resident who had eaten at the establishment on March 20, 2013, but who became ill and was tested while in Florida. The isolate had been discarded before PFGE testing could be done, but since both *S.* Oranienburg and *S.* Montevideo are Group C *salmonella*, therefore this case is being considered part of the outbreak. Interviews of the non-foodhandler cases revealed no food items common to all the cases. Symptoms reported by the ill cases included diarrhea, cramps, abdominal pain, and malaise (Table 1).

Figure 1. Symptom Onset of S. Montevideo/Oranienburg at TAR, March 2013

Table 1. Symptoms among Cases (n=6)

Symptom	Number of Cases	(%)
Diarrhea	5	83.3%
Abdominal	4	66.7%

B. Environmental

On March 28, 2013, FPP received a list of employees at the establishment and employee schedules. A review of the employee list revealed that there were 15 employees who would be required to submit stool specimens. A review of the employee schedule dated the week ending March 13, 2013 revealed that no employee took sick time. The Town C BOH and the FPP restricted any foodhandlers from food preparation until they tested negative, required thorough sanitation of the establishment, and mandated disposal of open food, which was confirmed by a state inspector. In order to comply with these recommendations, the establishment voluntarily closed on March 28, 2013 and was later asked by the BOH to remain closed until additional environmental cleaning and education had been conducted.

The inspection on March 29, 2013, revealed significant violations related to foodborne illness risk factors [Attachment 1]. Specifically, demonstration of food safety knowledge was inadequate, no employees had completed food manager certification training, and sanitizer was not diluted to the proper concentration. The inspector observed an employee mix a solution of sanitizer inadequately by combining water, cleaner, and chlorine bleach. The establishment did not have chlorine test strips to test the effectiveness of the sanitizer. The inspector tested the solution which measured in excess of 300 ppm, as opposed to the recommended concentration of 200 ppm. The person-in-charge implied through discussion of food preparation practices that handwashing practices were inadequate. There were no designated hand sinks in the food preparation areas. In response, the establishment voluntarily disposed of all remaining open containers of food, ready-to-eat food products, including all bakery goods, produce, dessert items prepared by an unapproved source from offsite in a home kitchen, and ice. The establishment remained under voluntarily closure until April 4, 2013, and the Town C BOH required a scheduled inspection prior to re-opening. Required conditions of re-opening included proof of professional sanitation; clearly designated, properly supplied, and fully accessible handwashing stations in the kitchen preparation areas, food safety training conducted by a professional consultant and the person-in-charge to obtain food safety manger certification.

On April, 4 2013, the re-inspection revealed that the establishment met all the conditions required by the Town C BOH to re-open.

C. Laboratory

1. Clinical
The PFGE lab confirmed the initially reported cases had positive stool cultures for *S.* Montevideo serotype and matched at two enzymes. Additional cases from Bristol County were subsequently matched by PFGE.

Four employees tested positive for *Salmonella* Montevideo indistinguishable by PFGE at two enzymes. One other foodhandler tested positive for *Salmonella* Oranienburg. All employees who tested positive worked in the Establishment B kitchen and regularly handled food.
All positive foodhandlers were required to submit two consecutive negative stool specimens produced at least 24 hours apart before returning to work. By April 29, 2013 all employees were cleared to return to work.

2. Food
No food testing was performed.

VI. Discussion

Salmonella is a bacterial agent that causes gastrointestinal illness in humans. The pathogen is typically ingested via contaminated food or water. Common symptoms include diarrhea, abdominal cramps, fever, nausea, and in some cases, vomiting. Illness typically develops 6-72 hours after consumption of contaminated food and lasts 4-7 days. *Salmonella* transmission is often propagated through contaminated animal products, such as poultry, beef, eggs, and dairy products or from the hands of an ill foodhandler who did not practice effective hand hygiene after using the bathroom.[2]

Epidemiologic and laboratory data suggest that in March 2013 an outbreak of *S.* Montevideo and *S.* Oranienburg occurred among employees and diners at Establishment B in Town C, MA. *S.* Montevideo with a PFGE pattern of JIXX01.0310 was isolated from four foodhandlers at the implicated restaurant and six additional individuals, three of whom reported dining at the restaurant during the month of March, before they became ill. In addition, *S.* Oranienburg was found in one foodhandler and one diner at Establishment B. An out of State resident who had eaten at Establishment B tested positive for *Salmonella* Group C, the same group to which *S.* Montevideo and *S.* Oranienburg belong.

All the foodhandlers, including those who tested positive for *Salmonella* species, denied experiencing any gastrointestinal illness but there is evidence to suggest that one or more foodhandlers may have been intermittently shedding the bacteria for many months.

In September 2012, the Hinton State Laboratory Institute PFGE Laboratory identified a cluster of *S.* Montevideo indistinguishable from the current cluster in the same geographic area. The 2012 cluster consisted of four County ZZ residents. Food histories were obtained from three of the cases, but no commonalities were found. However, the earlier cluster was reviewed in April 2013 and it was found that one of the three food histories included dining at Establishment B on September 9, 2012, five days before symptom onset. *Salmonella* shedding times vary and it is possible a food handler remained positive from September to March or the organism could have been passed among the food handlers at Establishment B over several months.

Three of the *Salmonella* positive foodhandlers were identified as staff who are routinely involved in food preparation, including the handling of raw chicken. Employees would tenderize raw chicken on a work surface directly adjacent to the fish, shrimp and the French Fry fryolator. The raw chicken and liquids could have contaminated cooked food as they were plated. Raw chicken is transferred to the grill, cooked, and then plated with tongs and a side of rice and salad are added to each plate before service. The person-in-charge at the establishment indicated that the two large parties ordered chicken and beef or chicken and fish, with sides of rice and salad.

A lack of good handwashing practices, preparing and manually tenderizing raw chicken directly adjacent to ready-to-eat food, no use of sanitizer on food contact surfaces and the overlapping of tasks performed by staff members could have contributed to this outbreak.

We were not able to link the three remaining cases to Establishment B. Nationally there were no other matches to this pattern, suggesting it was local in origin and not related to a widely-distributed ingredient. This reinforces the hypothesis that foodhandlers or work surface may have contaminated food served to patrons. The three cases who denied eating at the establishment, or were lost to follow up, lived near Town C and may have unknowingly consumed food from Establishment B or had contact with another ill person.

VII. Recommendations

The following recommendations were made for preventing foodborne illness transmission.

1. Foodhandling employees should be made aware of their duty to report symptoms of foodborne illness.
2. Foodhandlers should wash their hands thoroughly with soap and warm water before eating or preparing food, and after using the toilet.
3. Foodhandlers should use physical barriers such as gloves during preparation of ready-to- eat foods.
4. Employees involved in foodhandling should be trained in the appropriate use of gloves.
5. Foodhandlers should ensure that all food preparation areas are clean and sanitized before use.

VIII. Acknowledgments

MDPH acknowledges and thanks the Town C Board of Health for their cooperation and assistance in this investigation. Furthermore, the towns of D, E, F, and G BOHs should be acknowledged for their efforts in contacting cases and administering phone surveys which helped identify the source of the cluster.

References

1. Campbell JV, Mohle-Boetani J, Reporter R, et al. An Outbreak of Salmonella Serotype Thompson Associated with Fresh Cilantro. The Journal of Infectious Diseases 2001; 183: 984-7.
2. American Academy of Pediatrics. Section 3: Summaries of Infectious Diseases. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, eds. Red Book: 2012 Report of the Committee of Infectious Diseases. 29th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2012: 635-640.

Attachment 10-3: Example #3 Outbreak Report

MEMORANDUM

TO: The File

FROM: Writer of the Report

Date: August 7, 2015

Re: Salmonellosis Outbreak associated with Establishment A, in Town B, MA November 2014

WGFIC#: XXXXXX, MAVEN ID# NNNN

I. Summary

On November 20, 2014, the Epidemiology Program (EPI) was notified by an infection control nurse at a local medical center about a case of salmonellosis who was a dental hygienist and attended a conference at Establishment A in Town B, MA on November 12, 2014. The patient's hospital report also indicated that three of her coworkers were ill with the same symptoms and attended the same conference. The Town B local Board of Health (LBOH) conducted an inspection of Establishment A on November 21, 2014. Out of the 57 total events held at Establishment A from November 10, 2014 through November 24, 2014, 10 of them (including the conference) reported individuals with confirmed and/or suspected salmonellosis following the event. Sixteen out of 202 employees tested positive for *Salmonella* at the Hinton State Laboratory Institute (HSLI). All positive foodhandlers were excluded from food handling duties until two consecutive negative stool specimens were reported. Isolates of *Salmonella* Enteritidis from the 16 positive foodhandlers and 29 confirmed patrons had Pulsed- field gel electrophoresis (PFGE) patterns that matched. Although an exact source of the outbreak could not be identified, epidemiologic and laboratory evidence indicates that food served at several events held at Establishment A from November 11, 2014 to November 15, 2014 was the vehicle of transmission in this outbreak.

II. Introduction

On November 20, 2014, the Epidemiology Program (EPI) was notified by an infection prevention practitioner at a local medical center about a case of salmonellosis in someone who was employed as a dental hygienist and attended a conference at Establishment A in Town B, MA on November 12, 2014 (during her incubation period). The patient's hospital report also indicated that three of her coworkers were ill with the same symptoms and attended the same conference. This initiated a coordinated investigation by the Working Group for Foodborne Illness Control (WGFIC), EPI, the Food Protection Program (FPP), HSLI, and the LBOH. It was discovered through active surveillance that there were several other complaints of gastrointestinal illness among attendees of events held at the Establishment in November 2014.

III. Background

Establishment A is located in Town B, MA. It hosts and caters corporate, public, and social events. Food items served at the events are largely prepared, cooked, and served on site. Establishment B is another establishment associated with Establishment A, and employees frequently work at events at both locations.

IV. Methods

A. Epidemiologic

A confirmed case was defined as an individual who tested positive for *Salmonella* sp. and attended an event held at Establishment A in Town B, MA within 12-72 hours prior to their symptom onset. A suspect case was defined as an individual who experienced symptoms of salmonellosis (fever, diarrhea, abdominal cramps, and/or vomiting) within 12-72 hours of attending an event held at Establishment A in Town B, MA, but was not tested for *Salmonella* sp. infection. Patrons of the conference held at Establishment A on November 12, 2014 were sent an email containing a link to an online survey (Survey Monkey) on November 26, 2014 in order to obtain information on symptomatology and food items consumed during the event. Survey results were summarized using Microsoft Excel. Open Epi was used to calculate the relative risk and attack rate of each food item.

Contact information for the event organizer of the conference and 56 other events held at Establishment A from November 10, 2014 through November 24, 2014 were obtained from Establishment A's management. EPI attempted to contact the event organizers for all of these events in order to ask about additional complaints of illness. Attendees of additional events complaining of illness were not surveyed for detailed symptom and food item consumption information.

Each local board of health (LBOH) with a confirmed case associated with any event at Establishment A (including both employees and patrons) residing in their town was asked to complete information on symptoms and food item consumption. LBOHs were also asked to exclude foodhandlers from work for the appropriate amount of time according to the isolation and quarantine requirements set by the Massachusetts Department of Public Health [1].

B. Environmental

The LBOH conducted an inspection of both Establishment A and Establishment B on November 21, 2014 (Attachment 1). FPP accompanied the LBOH on an additional investigation on November 25, 2014 (Attachment 2). FPP issued a letter to the LBOH regarding the situation on December 2, 2014 (Attachment 3).

C. Laboratory

Due to evidence suggesting that employees float between Establishment A and Establishment B, it was decided that all foodhandling employees submit stool specimens to be tested for the presence of *Salmonella* sp., regardless of which establishment they worked at during the time period of interest. There were 202 employees that met the criteria for testing. Thirty-four additional employees were not tested, as they did not work at either location during November or December 2014, or they no longer worked for Establishment A at the time of testing. Any foodhandling employee who tested positive for *Salmonella* sp. was excluded from foodhandling duties until they could produce two consecutive negative stool specimens, 24 hours apart. Employees who chose to be tested through their healthcare provider had their laboratory results sent to the LBOH and EPI.

Stool specimens that test positive for *Salmonella* sp. at any laboratory in Massachusetts are routinely sent to HSLI for confirmation, serotyping and Pulsed-field gel electrophoresis (PFGE) analysis.

V. Results

A. Epidemiologic

A total of 10 events held at Establishment A from November 11, 2014 through November 15, 2014 were found to have confirmed and/or suspected cases of salmonellosis following their event [Table 1].

*Table 1. List of events and number of reported cases of salmonellosis associated with each event held at Establishment A, Town B MA**

Event Name	Event Date	No. confirmed	No. suspected	Total attendees
Club	November 11, 2014	1	2	19
Conference	November 12, 2014	18	44	230
Bank Luncheon	November 13, 2014	1	3	30
Awards Dinner	November 13, 2014	2	9	137
School Meeting	November 14, 2014	1	Unknown	32
Celebration	November 14, 2014	1	Unknown	60
Credit Union	November 15, 2014	1	2	14
Baby Shower	November 15, 2014	1	2	34
Retirement and Birthday party	November 15, 2014	0	2	30
Formal Dinner	November 15, 2014	3	35	112

**Where available, the number of suspected cases represents an estimate of those who reported symptoms of salmonellosis but were not tested (according to the event organizer).*
***See below for a detailed description of survey results from attendees at the conference.*

Twenty-nine cases of salmonellosis were identified in people who attended one of the above events at Establishment A during their incubation periods, from November 11, 2014 through November 15, 2014. Confirmed cases consisted of six males (21%) and 23 females (79%). Case ages ranged from 20 to 81 years, with a mean age of 49 years. All 29 cases consumed food items at an event held at Establishment A between November 11, 2014 and November 15, 2014. The dates of symptom onset ranged from November 12, 2014 through November 24, 2014 and lasted an average of 10 days (range: 4-19 days). A summary of reported symptoms can be seen in Table 2. There were four hospitalizations and no deaths reported.

Table 2. Reported symptoms among confirmed cases of salmonellosis that attended an event at Establishment A in Town B, MA from November 11, 2014 through November 15, 2014 (N=29)

Symptom	N	%
Diarrhea	26	90
Abdominal cramps	22	76
Fever	13	45
Bloody stool	6	21
Vomiting	6	21

Conference Survey Results

Eighty-one (35.2%) of the attendees of the conference held on November 12, 2014, responded to the online survey distributed on November 26, 2014. Fifty-five (67.9%) self- reported symptoms of gastrointestinal illness (vomiting, diarrhea, fever, and/or abdominal cramps) within 12-72 hours of the event, consistent with the suspect case definition. Symptom onset ranged from November 12, 2014 through November 19, 2014, and lasted an average of 9 days (range: 3-25 days, Figure 1). Two additional attendees reported symptoms of gastrointestinal illness, but did not provide symptom onset dates and were excluded from Figure 1. Ten of the attendees included in Figure 1 could not recall when their symptoms ended and were excluded from the calculation of average duration of illness. Of those who reported illness, 20 sought medical attention and five were hospitalized.

Sixty-nine attendees provided food histories (response rate: 30%). Of those who provided a food history, 51 reported symptoms of gastrointestinal illness (identified as No. Ill in Table 3) and 18 did not report symptoms of gastrointestinal illness (identified as No. Well in Table 3). An analysis of food items consumed by the conference attendees is presented in Table 3.

Twelve attendees who responded to the survey (six who reported having gastrointestinal symptoms and six respondents who did not) were excluded from analysis of food items due to poor food history.

B. Environmental

The inspections conducted by the LBOH of Establishment A and Establishment B on November 21, 2014 yielded issues pertaining to good retail practices (Attachment 1). The LBOH also compiled and forwarded to FPP documentation including employee schedules, event menus, food prep information, staff lists, and food invoices.

The investigation conducted by the FPP and LBOH of Establishment A on November 25, 2014 yielded observations pertaining to inadequate knowledge of employee health reporting, improper dishwashing procedures, and an improperly operating dishwashing machine (Attachment 2).

As a result of issues noted during the inspections, Establishment A hired a consultant to start on December 1, 2014 to assess policies and procedures, review operational performance, issue recommendations, and perform staff training.

The letter issued from FPP to the LBOH on December 2, 2014 outlined the situation at the time, issues noted during previous inspections, and requirements needing to be met to move forward (Attachment 3). Establishment A issued a response letter to the LBOH on December 2, 2014 (Attachment 4); and the LBOH issued a response letter to FPP on December 29, 2014 outlining actions taken (Attachment 5).

C. Laboratory

A total of 457 stool specimens from 202 employees were tested at HSLI from November 26, 2014 through January 21, 2015. Sixteen of the 202 foodhandlers who submitted stool specimens to HSLI for *Salmonella* screening had a positive culture for *Salmonella* Enteritidis. Five positive foodhandlers reported symptoms of gastrointestinal illness (vomiting, diarrhea, fever, and/or abdominal cramps), with symptom onsets ranging from November 15, 2014 to December 8, 2014. The remaining 11 reportedly did not experience symptoms. One

additional employee reportedly experienced symptoms of gastrointestinal illness beginning at an unknown date, but tested negative for *Salmonella* during the screening period.

Through the use of PFGE in this investigation, all positive stool specimens from employees were linked to the 29 positive stool specimens from patrons of

Establishment A. The Xbal pattern identified in all isolates was JEGX01.0034.

VI. Discussion

Salmonella is a bacterial pathogen that can cause gastrointestinal illness in humans. *Salmonella* are bacteria that cause infection as a result of swallowing contaminated food or water. The most common symptoms are diarrhea, stomach cramps, fever, nausea, and sometimes vomiting. Cases usually develop symptoms from 6-72 hours after ingestion; symptoms usually last 4-7 days. The organism is typically spread through the fecal-oral route or through fecal contamination of food items. The major vehicle of transmission of Salmonella is food of animal origin, such as poultry, beef, eggs, and dairy products. Food may also become contaminated by the hands of an infected foodhandler who did not properly wash hands with soap and water after using the bathroom.

In this outbreak, one or more individuals at each of 10 events held at Establishment A from November 10 through November 24, 2014 were either confirmed with *Salmonella* matched to the outbreak strain or had symptoms consistent with Salmonellosis in the days after attending the event. Twenty-nine patrons and 16 foodhandlers were positive for the outbreak strain of the bacteria.

Based on the epidemiological evidence and the testing results it can be concluded that food contaminated with *Salmonella* served at Establishment A in Town B, Massachusetts in November 2014 was the likely cause of this outbreak. It cannot be concluded, however, exactly which food was contaminated and how that food became contaminated.

Since the conference was the largest of the events identified with sick attendees and the first identified, efforts were made to determine a source of illness other than just attendance at the conference. However, no individual food item was statistically associated with illness.

Sixteen foodhandlers tested positive for the outbreak strain of *Salmonella* three weeks after the implicated events were held, many of whom reported no symptoms. What we do not know is if these foodhandlers contracted *Salmonella* by eating the same contaminated food as the patrons, handling food that was contaminated with *Salmonella*, or from fellow foodhandlers who were shedding *Salmonella* in their stools and not practicing good hand hygiene while working. Foodhandlers can shed *Salmonella* in their stool for days to weeks after their symptoms subside. In this outbreak, the average number of days for a positive foodhandler to be cleared to return to work was 28 days (range: 11-56 days). It is also possible that other foodhandlers were positive at the time of the outbreak, but were no longer shedding the bacteria at the time of testing.

While we may never know for sure what caused this outbreak, it is likely that this strain of *Salmonella* was introduced into the facility either through food or a foodhandler shedding the bacteria prior to, or at, the first

implicated event on November 11, 2014, the day before the conference. Food served at subsequent events was most likely contaminated by one or more positive foodhandlers shedding the bacteria and then not using proper foodhandling practices, including appropriate hand hygiene.

VII. Recommendations

The following recommendations were made for preventing foodborne illness transmission:

- Foodhandling employees should be made aware of their duty to report symptoms of foodborne illness.
- Foodhandlers should wash their hands thoroughly with soap and warm water before eating or preparing food, and after using the toilet.
- Foodhandlers should follow proper hand hygiene after handling raw poultry, wash cutting boards and utensils with soap and water after contact with raw poultry, avoid contact of fruits and vegetables with juices of raw poultry, and cook poultry thoroughly.
- Cook all poultry products thoroughly. Make sure that the meat is cooked throughout (no longer pink) and any juices run clear. All poultry should be cooked to reach a minimum internal temperature of 165°F.
- Prevent cross-contamination in the kitchen by using separate cutting boards for foods of animal origin and other foods and by thoroughly cleaning all cutting boards, countertops, and utensils with soap and hot water after preparing raw food of animal origin.

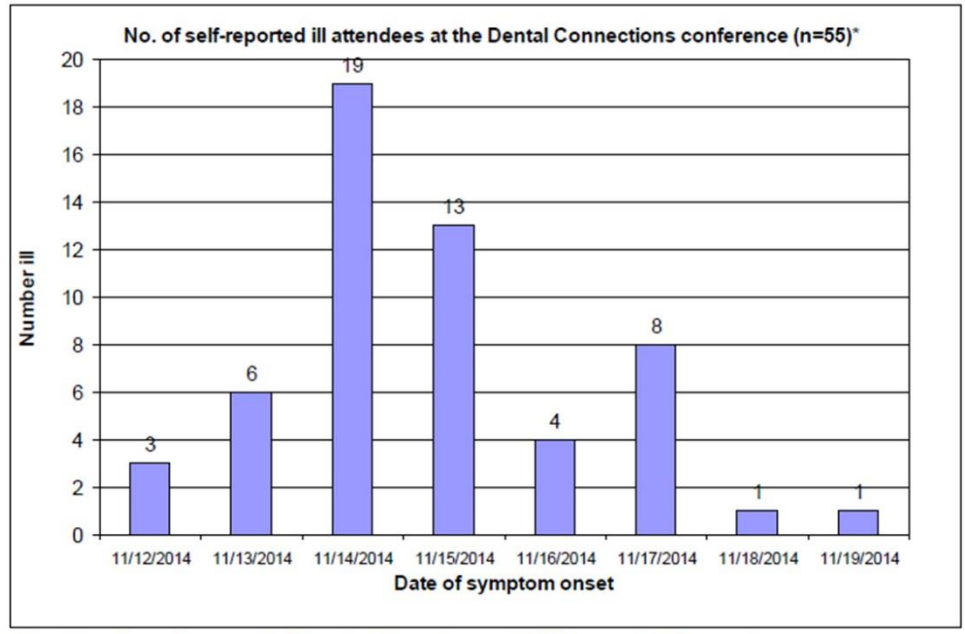
VIII. References

1- 105CMR300.000 Summary of Reportable Diseases, Surveillance, and Isolation and Quarantine Requirements: http://www.mass.gov/eohhs/docs/dph/cdc/reporting/rdiq-reg-summary.pdf

IX: Acknowledgements

The Massachusetts Department of Public Health would like to acknowledge the LBOH and Establishment A for their assistance in this investigation.

Figure 1: Onset of Illness



*Two attendees who reported they had symptoms of GI illness after the conference on November 12, 2014 did not report symptom onset dates and were not included in the Number ill for Figure 1.

Table 3. Food item attack rates consumed at the conference on November 12, 2014

	Ate			Didn't Eat				
	No. Ill	No. Well	Attack Rate	No. Ill	No. Well	Attack Rate	Relative	95% Confidence
Water	48	16	75	3	2	60	1.25	0.60, 2.59
Coffee	26	6	81	25	12	68	1.20	0.91, 1.59
Tea	2	4	33	49	14	78	0.43	0.14, 1.34
Breadsticks	25	8	76	26	10	72	1.05	0.79, 1.39
Salad	40	14	74	11	4	73	1.01	0.72, 1.42
Salad dressing	35	12	74	16	6	73	1.02	0.75, 1.39
Seasonal vegetable	40	12	77	11	6	65	1.19	0.81, 1.74
Potato	38	9	81	13	9	59	1.37	0.94, 1.99
Maple Turkey Breast	41	10	80	10	8	56	1.45	0.94, 2.24
Stuffed scrod with crabmeat stuffing	33	9	79	18	9	67	1.18	0.86, 1.61
Vegetable lasagna	25	8	76	26	10	72	1.05	0.79, 1.39
Pork dijonaise	34	7	83	17	11	61	1.37	0.98, 1.90
Red velvet trifle	43	13	77	8	5	62	1.25	0.79, 1.96

X: Attachments

Attachment 1: LBOH Establishment A Inspection Report (November 21, 2014) Attachment 2: FPP/LBOH Establishment A Inspection Report (November 25, 2014)

Attachment 3: FPP letter to the LBOH on December 2, 2014

Attachment 4: Establishment A letter to the LBOH on December 2, 2014 Attachment 5: LBOH letter to FPP on December 29, 201