Illness at the Inn

A Foodborne Illness Outbreak Investigation Case Study

Developed by the

Colorado Integrated Food Safety Center of Excellence

INSTRUCTOR

Colorado Integrated Food Safety CENTER OF EXCELLENCE

Integrated Food Safety Centers of Excellence

Summary

This case study is based on a local foodborne illness outbreak at a hotel. It is designed to be completed by public health students or new foodborne illness outbreak investigators. Participants should have a basic knowledge of epidemiologic concepts and methods.

Learning Objectives

After completing this case study, participants should be able to:

- Explain what constitutes a foodborne illness outbreak.
- Describe the steps in a foodborne illness outbreak investigation.
- Develop interview questions for potential cases.
- Establish an outbreak case definition.
- Create and interpret an epidemic curve.
- Describe the types of epidemiological studies used during an outbreak investigation.
- Calculate and interpret relative risks.
- Describe the information needed to conduct a traceback investigation.

Intended Use

This case study is designed to be discussed in-person or via bi-directional video with a small group (8-15 participants) led by an instructor or facilitator with experience investigating foodborne outbreaks. We recommend allowing at least two hours to complete the case study.

Required materials may include pens, paper, a whiteboard, and calculators. Some activities would benefit from having internet access (e.g., using www.openepi.com to calculate 95% confidence intervals). Specific instructions for the instructor are provided in the text of the case study and in the appendix**. It will be useful to refer to the appendix while working through the outbreak scenario.**

Specific instructions for the instructor/facilitator are indicated with this symbol.

Guided answers for the instructor/facilitator are indicated with this symbol.

This case study was developed by the Colorado Integrated Food Safety Center of Excellence. For additional information, or to provide feedback, visit http://www.COFoodSafety.org

PART A: BEGINNING THE INVESTIGATION

Initial Complaint Call

You work as an enteric disease epidemiologist at the Local Public Health Department. On Thursday, March 27th, you receive a phone call from Tami at a local hospital. She informs you that the previous day, a 42-year-old woman came into the hospital with diarrhea, fever, and abdominal cramps. The patient said that she knew of two other people experiencing similar symptoms after attending a wedding.

Question 1: You interview the case-patient and two of her companions who reported experiencing similar symptoms. What questions would you ask these people?

You should try to obtain as much information as possible during the initial interview, as you may be unable to contact these people again. You need to find out more about the ill people and the event.

Questions may include:

Demographic and contact information:

- How old are they?
- Where are they employed?
- What are their job responsibilities?

Clinical details:

- What type of symptoms are they experiencing?
- When did their symptoms begin?
- Have they sought medical care or received a diagnosis?
- If not, are they willing to submit a stool sample for testing?
- Were they hospitalized?

Information about potential exposures:

- What events or gatherings did they attend recently?
- What activities did they participate in during the event?
- Was food served at the event or gathering?
- Did they eat out at any restaurants recently?
- What foods did they eat?
- Did they travel recently? If so, where?
- Do they know of others who are sick?
- Are any of their family members or other close contacts ill with similar symptoms?

You interview the three ill people by telephone on March 28th. All reported experiencing similar symptoms of diarrhea, fever, and abdominal cramps. You learn that they all attended a wedding reception at the Hyperion Hotel on March 24th. All of them stayed at the hotel for different lengths of time between March 21st and March 28th. They said they knew other ill people who had attended the wedding and agreed to submit a stool sample for testing.

The Hyperion Hotel is a modest, boutique 15-room hotel with a small event space, a restaurant, and a pool/game room. The popular hotel restaurant serves a daily breakfast, lunch, and dinner. Breakfast items are available from a menu as well as a daily breakfast buffet. Full service banquet and reception facilities are available including food preparation.

Question 2: Is this an outbreak? Why or why not?

The general definition of an outbreak is the occurrence of cases of disease in excess of what would normally be expected in a defined community, geographical area, or season. The Centers for Disease Control and Prevention (CDC) defines a foodborne illness outbreak as an incident in which two or more persons experience similar illness resulting from ingestion of a common food.

This is likely an outbreak for the following reasons:

- The three ill people reported similar symptoms (diarrhea, fever, and abdominal cramps), suggesting that they all experienced a similar illness.
- All ill people attended a wedding reception at the Hyperion Hotel on March 24th.
- While the route of transmission (e.g., foodborne or person-to-person) is unclear, initial information suggests the cases had a common exposure.

All three cases reported similar symptoms and a common exposure (i.e., attending a wedding reception at the Hyperion Hotel). In addition, they all said they knew of other ill people who had attended the wedding. Based on this information, you decide to initiate an outbreak investigation. As a first step, you work on identifying and interviewing additional cases.

Question 3: How would you identify additional cases?

To identify additional cases, you could:

- Obtain a list of wedding reception attendees (i.e., the bride and groom may have an electronic copy of their guest list).
- Ask the ill people that you interview if they know of other ill people.
- Ask the hotel for a list of people who had stayed at the hotel. (Note that some hotels and businesses may need prompting and an explanation of the public health authority to investigate outbreaks before releasing patron or guest information).
- Ask the Hyperion Hotel about any recent illness among staff.
- Review similar other complaints received by your agency or other nearby agencies.
- Contact healthcare facilities to find reports of other ill people.

PART B: EPIDEMIOLOGIC STUDY

The bride and groom provide you with their wedding guest list. The Hyperion Hotel also agrees to provide you with a roster of people who stayed at the hotel during the week of March 21st to March 28th, including their email address or telephone number.

Hypothesis generating interviews of hotel and wedding guests were conducted using a brief questionnaire with open-ended questions. Questions were designed to determine if illness occurred and to generate hypotheses about potential modes of transmission, including food vehicles. Over the next two days, your team successfully contacts 23 hotel and wedding guests who experienced a diarrheal illness. Illness onset dates ranged from March 23rd to March 28th. All of those who reported symptoms stayed overnight at the hotel. Ill people included non-wedding guests.

Question 4: Based on the information so far, develop a case definition for this outbreak.

Case definitions establish specific criteria for classifying cases, while also ruling out illnesses not associated with the outbreak. Student case definitions may vary, but all should include information about person, place, time, and clinical information.

Students should develop a case definition like the example below:

> "A case is defined as a person experiencing diarrhea (having 3 or more loose stools, bloody or non-bloody, in a 24-hour period) and one other clinical symptom, such as fever or abdominal cramps, after staying at the Hyperion Hotel between March 21st and March 28th."

The case definition should include hotel guests that did not attend the wedding, as ill people included non-wedding guests.

Your team defines a case as "a person having diarrhea (at least 3 or more loose stools, bloody or non-bloody, in 24 hours) and one other clinical symptom (such as fever or abdominal cramps), after staying at the Hyperion Hotel between March 21st and March 28th."

Stool samples from the initial three patients come back from the state public health laboratory positive for *Shigella sonnei*. *Shigella sonnei* is a bacterial pathogen. Symptoms which include watery or bloody diarrhea, fever, and abdominal pain typically start 1-2 days after exposure and usually last 5-7 days in people with healthy immune systems. *Shigella* is very infectious and only a small number of bacteria (10-200 organisms) are required to cause infection. *Shigella* can be spread by food, water, or person-to-person contact (CDC, 2016). *Shigella* sonnei outbreaks occur commonly in day care settings due to person-to-person transmission. Foodborne outbreaks are less common.

Question 5: Using the line list in Appendix A, apply the outbreak case definition and create an epidemic curve for this outbreak. What pattern of spread does the epidemic curve suggest?

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Students should work individually or in small groups to construct the epidemic curve like the example shown below.

Guidance for constructing an epidemic curve:

- The epidemic curve is a histogram showing the number of outbreak-associated cases by their time of symptom onset.
- The figure should include a brief, descriptive title including place and time.
- The axes should be clearly labeled; x-axis represents the date or time of symptom onset among cases, y-axis shows the number of cases.
- There should be no gaps between the bars of the histogram, but there should be space before the first onset day and after the last onset day.
- The scale used for the x-axis should be 1/2-1/3 of the incubation period for *Shigella* (3-4 days). In this case, students should use 1-day increments.

There are three types of patterns of spread: point source, common source, and propagated.

- Point source outbreaks are caused by exposure to the same source over a brief period. The cases rise rapidly to a peak and fall off gradually, and a majority of cases are present within one incubation period. For example, cases of diarrheal illness after an office luncheon.
- Common source outbreaks are from exposure to the same source over a prolonged period of time. The epidemic curve rises gradually, and may plateau. For example, a Hepatitis A outbreak associated with an infected food worker.
- Propagated outbreaks spread from person-to-person with a series of progressively taller peaks where peaks are usually one incubation period apart. For example, the SARS-CoV-2 pandemic.

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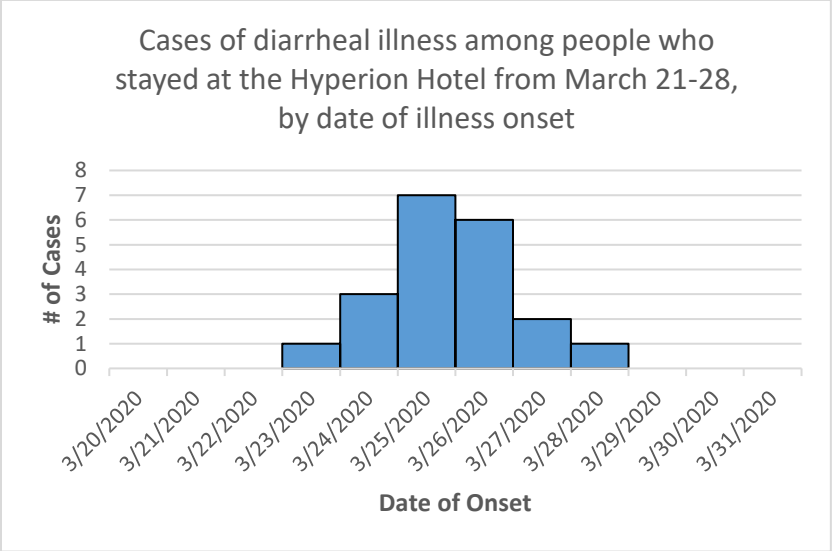
The number of illnesses rises rapidly to a peak. This pattern suggests a point source outbreak, in which cases were exposed over a brief time to the same source.

Twenty people from the linelist meet the outbreak case definition. The number of illnesses rises rapidly to a peak and fall off gradually, with a majority of cases within one incubation period. This pattern suggests a point source outbreak, in which cases were exposed over a brief time to the same source.



You conduct a descriptive analysis of the activities cases reported doing while staying at the hotel. The most commonly reported activities and exposures are given below along with some demographic information.

Table 1: Activities that cases participated in while staying at the Hyperion Hotel (N=20)		
Activity	**N**	**%**
Swam in the pool	9	39%
Swam in the hot tub	6	30%
Ate at breakfast buffet	17	85%
Attended wedding reception	11	55%
Attended other hotel event	7	35%
Used fitness center	5	22%

Table 2: Case Demographics (N=20)	
# of females	11 (55%)
# of males	9 (45%)
Median age	52 years
Age Range	1-89 years

Question 6: After examining information on what the guests did during their stay at the Hyperion Hotel, what is your hypothesis about how the cases were exposed to *Shigella?*

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17 out of 20 cases, or 85%, ate at the hotel's breakfast buffet. The next highest exposure was the wedding reception, which 11 out of 20 (55%) of cases attended. It seems likely that the cases may have been exposed to *Shigella* through an item served at the breakfast buffet.

Since 17 out of 20 cases reported eating an item at the breakfast buffet, you suspect that cases may have been exposed to a food item served at the hotel's buffet breakfast.

Question 7: What type of epidemiologic study should you conduct to investigate this outbreak? Why?

Review the two types of epidemiologic studies most commonly used in outbreak investigations: case-control and cohort studies.

- A **cohort study** is used when there is a well-defined group of individuals. Cohort studies compare the incidence of disease between exposed and unexposed people. Cohort studies are usually conducted when members of the group are easily identifiable and there are less than 200 people in the cohort. An example would be all employees in an office building or everyone who attended a wedding.

- A **case-control study** is often used when the disease or outcome of interest is rare, or when the group is not well-defined. Case-control studies compare the odds of exposure between cases and controls (well people). Case-control studies are usually conducted when the cohort is difficult to identify and may be too time-consuming to conduct all of the interviews and there are more than 200 people. An example would be prison inmates across multiple sites or a large public event during a holiday weekend.

Because the hotel guests represent a well-defined group with contact information easily available, a cohort study would be an appropriate epidemiological study to use in this outbreak. However, if resources were limited and staff only had time to interview a subset of attendees, a case-control study would be acceptable. A cohort study is feasible in this situation because only 65 people stayed at the hotel during the week of interest.

Given the hotel guests represent a well-defined group with easily available contact information, your team decides to conduct a cohort study. You and your team attempt to interview the 65 ill and well guests who stayed at the hotel between March 21st and March 28th using a questionnaire that assesses the onset of patients' symptoms and what foods/drinks they consumed while staying at the hotel. Wedding attendees who did not stay overnight at the hotel were considered "non-guests" and were not included in the cohort study. You and your team were able to contact 57 of the 65 hotel guests.

You collect information on what the ill guests and well guests ate:

Table 3: Food Items Consumed by Hyperion Hotel Guests between March 21-28

Item	Ill Guests Exposed	Well Guests Exposed	Risk Ratio	95% CI
Orange Juice	10	15	1.3	0.63-2.59
Skim Milk	11	20	?	?
Bacon	8	10	1.44	0.72-2.91
Sausage	6	10	1.1	0.51-2.35
Pancakes	15	20	1.9	0.79-4.46
Scrambled Eggs	17	21	2.8	0.95-8.49
Strawberries	17	22	2.6	0.88-7.80
Honeydew Melon	19	8	?	?
Total	20	37	-	-

Question 8: Use the information in the table provided to calculate the missing risk ratios and 95% confidence intervals for Honeydew Melon and Skim Milk and interpret the risk ratios. What foods may have been the source of this outbreak?

If needed, review how to calculate risk ratios. Begin by having the students first complete 2x2 tables for each exposure. Then remind students the formula for a risk ratio: (A/(A+B)/(C/C+D). Students can work on calculations in pairs or independently.

To calculate the 95% confidence intervals, students should use EpiInfo or other software, if available. If not available, students can skip this part.

Once students are done, have them share what results they came up with when calculating relative risks and confidence intervals. After they have shared their calculations, ask them to interpret what the risk ratios mean.

Table 1: Calculating relative risks in a cohort study

Exposure (or risk factor)	Number of people	
	Ill persons	Well persons
Present	*a*	*b*
Absent	*c*	*d*
Total	*a+c*	*b+d*

Relative risk $\frac{\text{Incidence proportion in exposed}}{\text{Incidence proportion in unexposed}}$ $\frac{\frac{a}{a+b}}{\frac{c}{c+d}}$

Interpreting Relative Risks:

- Close to 1.0, the risk of disease is similar among people with or without exposure and the exposure is not associated with illness.
- Greater than 1.0, the risk of disease is higher among people exposed when compared to people unexposed and the exposure could be a risk factor.
- Less than 1.0, the risk of disease is lower among people exposed when compared to people unexposed and the exposure could be a "protective factor".
- The magnitude of the risk ratio reflects the strength of association between eating food illness.

Ⓐ **Honeydew Melon:** RR=21.1, 95% CI= [3.03, 147.3] Persons who ate honeydew melon were 21.1 times more likely to become ill than periods who did not have honeydew melon. There is a significant association between consuming honeydew melon and becoming ill, because the 95% CI does not include one.

	Ill Guests	Well Guests
Had honeydew melon	19	8
Did not have honeydew melon	1	29

Skim Milk: RR= 1.03, 95% CI= [0.5, 2.1] Persons who had skim milk were 1.03 times more likely to become ill than persons who did not have skim milk. There is not a significant association between consuming skim milk and becoming ill, because the 95% CI does include one.

	Ill Guests	Well Guests
Had skim milk	11	20
Did not have skim milk	9	17

People who ate honeydew melon were significantly more likely to become ill than persons who did not have honeydew melon (RR: 21.1; 95% CI: 3.03, 147.3). Drinking skim milk was not significantly associated with illness (RR: 1.03; 95% CI: 0.5, 2.1). Honeydew had a relative risk of 21.1 and was the only food significantly associated with illness, indicating that honeydew melon may have been the source of the outbreak.

PART C: ENVIRONMENTAL ASSESSMENT AND TRACEBACK

Environmental health professionals on your team conducted an environmental assessment of the hotel restaurant. Full access to the facility, including the bar area, event space, restaurant, breakfast buffet, and restaurant kitchen was granted. Investigators were permitted to interact with the kitchen staff and the Chef. The kitchen staff were questioned regarding the preparation of fruit, specifically the honeydew melon.

Question 9: What questions would you ask the kitchen staff regarding the preparation of honeydew melon?

An environmental assessment is a systematic, detailed, science-based evaluation of environmental factors that contributed to transmission of a particular disease in an outbreak. It focuses on the outbreak and considers how the causative agent, food vehicle, processing methods, contributing factors and environmental antecedents interacted to result in the food becoming contaminated.

During an environmental assessment, investigators will undertake many activities that focus on implicated food. Some acitivities include interviewing managers, walking through the facility, observing the daily operations, collecting samples from the food and environment, interviewing workers, and collecting records.

Answers may include the following:

- How many people are responsible for cutting the melon?
- Describe the process of preparing and cutting the melon.
- Do they use bleach to wash the melons?
- Where/how are the melons stored?
- How often are the melons cut?
- How often is the temperature of the melon taken at the breakfast buffet?

Two individuals in the kitchen prepare the melon. The protocol described by the primary person who cuts melon involves washing with cold water in the vegetable prep sink, peeling the rind, slicing, seed removal, and dicing. A kitchen supervisor indicated that he requires a dilute bleach wash prior to cutting the melons, but is unsure if this is performed when he is not present. Melon is stored in a clean pan and placed into the serving pan with tongs. Serving pans are placed on the buffet on ice. The pan is then stored in the walk-in cooler. If needed, the buffet is refilled from the refrigerated stored melon. There were conflicting reports about how many days the cut melon was used. Kitchen staff indicated that melon is cut up daily, while the supervisor indicated that enough melon is cut up for a 3-day supply.

Three food handlers reported being sick with a diarrheal illness (Jenny Costella, Joe Kendall, and Nicholas Fisher), including one employee who routinely cuts melons. The employees all reported eating items from the breakfast buffet. The employees became ill on March 25th. One of the ill staff members reported that the only item he had eaten was a bowl of honeydew melon on March 23rd.

Question 10: Do you think it is likely that an infected staff member was the source of the outbreak? Refer to the kitchen staff schedule (Appendix B), the results of the environmental assessment (Appendix C), and the epidemic curve.

When looking at the results of the environmental assessment, students should pay attention to food holding temperatures, the potential for cross-contamination, and evidence of safe handling practices.

It is unlikely that a kitchen staff member was the source of the outbreak. Based on the results of the interviews, guests began having symptoms on March 23rd. The staff members began exhibiting symptoms on the 25th and stayed home from work, so it is unlikely that they contaminated food although they should be included as cases in the outbreak. In addition, the environmental assessment indicates that all food was held at safe temperatures and that safe handling practices were used, so this makes it less likely that *Shigella* originated from the kitchen staff. Ill foodworkers should be interviewed about foods eaten and stool samples should be collected.

The results of the environmental assessment indicate that the kitchen staff practiced good hygiene and properly stored, thawed, and cooked all food. Additionally, staff member symptoms began after the onset of case symptoms, and ill employees were not allowed to be at work while they had symptoms. You and your team decide it is unlikely that a food worker or food handling practices at the hotel were the source of contamination.

Your team decides to conduct a traceback investigation to determine where the melons served during the week of March 21-28 came from.

Question 11: What information do you need to conduct a traceback investigation? What agencies should you partner with to conduct the traceback investigation?

A traceback investigation is the process used to determine the production and distribution chain of a vehicle implicated during the investigation of an outbreak.

Traceback information can be obtained either through the environmental assessment or by contacting the food supplier for the food establishment in question. Useful information in a traceback investigation includes:

- Name/brand of product
- Names of customers
- Where/when purchased
- Grade
- Color
- Quantity/size/weight
- Manufacturer
- Supplier
- Distributor
- Lot or batch number
- Date produced
- Date shipped
- Dates/time/quantity of deliveries
- Location of production facilities
- Sell by date or code
- Use by date or code

The route of food through the farm to fork continuum can be complex and, therefore, requires collaboration with internal and external partners for a successful traceback investigation. Partners should include the FDA or USDA (depending on the product), state health officials in your state as well as the state the product is grown in, and company representatives for access to documents and facilities. If a product was distributed to multiple states, the FDA and CDC may also be involved to help coordinate investigations.

Reports from some kitchen staff indicated that recent melon shipments were excessively dirty or of low quality. Invoices were obtained for a traceback investigation. These invoices indicated: the name/brand of product; the shipping date; lot numbers; the quantity/weight of melons purchased; and the name of the distributors.

FDA conducted a traceback investigation on the lot number(s) and source(s) of the honeydew melon. Two distributors had been supplying the kitchen with honeydew melons. Honeydew melons were traced to two farms in California from which the implicated melons were shipped. The U.S. FDA investigation was inconclusive with respect to a possible source of contamination. There were no indications that farm workers were ill at the time of harvest and handling for shipment. Canal water samples on the farms were negative for *Shigella*.

Summary

Results of the investigation indicated that an outbreak of *Shigella sonnei* occurred among guests and employees of Hotel A. Epidemiologic and environmental evidence implicated the honeydew melon served at the breakfast buffet. Contamination cannot be pinpointed to a specific day but likely occurred during the period of March 21-23. Transmission over several days is likely to have occurred because honeydew melon was reportedly prepared as a batch for serving over multiple days. Kitchen workers were ill following this period and involved in food preparation. Because *Shigella sonnei* is reportedly transmitted by as few as ten organisms, secondary transmission or contamination of foods could have occurred from infected kitchen staff.

A request for a U.S. Food and Drug Administration traceback on honeydew melon used at the Hotel was made. Two distributors had been supplying the kitchen with honeydew melons. U.S. Food and Drug Administration personnel conducted the traceback investigation. Implicated farms were identified in California. No source of contamination was identified.

Pulsed-field gel electrophoresis (PFGE) was performed on the isolates. Six isolates, one from a kitchen worker and five from guests of the hotel were determined to have indistinguishable patterns following restriction with a single enzyme. No additional matching isolates were reported in response to the PulseNet posting.

From 1973 to 2011, melons have caused 34 outbreaks, resulting in 3602 illnesses, 322 hospitalizations, 46 deaths, and 3 fetal losses (Walsh, 2014). Over half (56%) of these outbreaks were due to cantaloupes, 38% to watermelons, and 6% to honeydew. *Salmonella* was the most common enteric disease reported from melon outbreaks, accounting for 56% of outbreaks, with norovirus accounting for 15% (Walsh, 2014). In another study, out of 85 foodborne melon outbreaks in North America, only 2.4% were caused by *Shigella* (Codex Committee, 2011).

Appendix A: Line list of cases

Interviewee	Sex	Age	Diarrhea	Number Stools (in 24 hours)	Fatigue	Cramps	Myalgias	Nausea	Headache	Fever	Vomiting	Illness Onset	Symptom Duration (Days)
23	F	11	Y	10	Y	Y	N	Y	Y	N	N	3/23/2016 4pm	4
3	M	36	Y	7		Y	N	N	N		Y	3/24/2016 5pm	5
4	M	59	Y	8	N	Y	Y	N	N	N	Y	3/24/2016 5pm	5
17	F	36	Y	7	Y	Y	N	N	N	N	N	3/24/2016 6pm	6
2	F	81	Y	6	Y	Y	Y	N	Y	Y	N	3/25/2016 11pm	6
19	F	61	Y	5	Y	Y	Y	Y		N	Y	3/25/2016 12pm	7
21	M	17	Y	6	Y	Y		Y		Y	N	3/25/2016 3am	8
22	F	19	Y	5	Y		Y	Y	Y	Y	Y	3/25/2016 4am	4
9	M	80	Y		Y	N	Y	Y	N		N	3/25/2016 5pm	6
14	F	89	Y	9	Y	Y	Y	Y	Y	Y	N	3/25/2016 6am	5
5	M	80	Y	5	Y	Y	Y	Y	Y	Y	N	3/25/2016 6pm	6
6	M	1	Y	7	Y	Y	Y	Y	N	N	N	3/25/2016 8am	4
16	F	24	Y	1	Y	N	Y	N	Y	Y	N	3/26/2016 11am	7
11	M	57	Y	8	N	Y	N	N	Y	Y	N	3/26/2016 1am	5
18	F	24	Y	4		Y	Y	Y	Y	N	N	3/26/2016 2am	7
7	F	72	Y	4	Y	N	Y	N	N	Y	N	3/26/2016 4pm	6
15	M	6	Y	3	Y	Y	Y	Y	Y	Y	N	3/26/2016 7am	5
20	F	54	Y	8	Y	Y	Y	N	Y		Y	3/26/2016 8am	7
10	M	39	Y	4	Y	Y	N	N	N	N	N	3/26/2016 9pm	8
13	M	53	Y		Y	Y	Y	N	Y	Y	Y	3/27/2016 1pm	5
1	F	53	Y	7	Y	N	N	Y	Y		Y	3/27/2016 2am	7
12	F	52	Y	7	N	Y	Y	Y	Y	Y	N	3/27/2016 4pm	5
8	M	27	Y	3	Y	Y	N	Y	Y	N	N	3/28/2016 2am	6

Appendix B: Hyperion Hotel Kitchen Staff Schedule

	Monday 3/20/2016	Tuesday 3/21/2016	Wednesday 3/22/2016	Thursday 3/23/2016	Friday 3/24/2016	Saturday 3/25/2016	Sunday 3/26/2016
Rebecca Carey	6-2 PIC	6-2 PIC	OFF	OFF	6-2 PIC	6-2 PIC	6-2 PIC
Jack Foley	OFF	1-10 PIC	1-10 PIC	1-10 PIC	1-10 PIC	1-10 PIC	
Hilary Radcliff	1-10 PIC	OFF	6-2 PIC	6-2 PIC	OFF	OFF	1-10 PIC
Jenny Costella	6-2 PREP	6-2 PREP	6-2 PREP	OFF	6-2 PREP	OFF	OFF
Ryan Zert	OFF	1-9 PREP	OFF	6-2 PREP	OFF	6-2 PREP	6-2 PREP
Peter Donovan	OFF	OFF	OFF	1-9 PREP	1-9 PREP	1-9 PREP	1-9 PREP
Sharon Daugherty	1-9 PREP	OFF	1-9 PREP	OFF	6-2 PREP	6-2 PREP	OFF
Martin Vasquez	8-5 LINE	OFF	OFF	OFF	8-5 LINE	8-5 LINE	8-5 LINE
Joe Kendall	OFF	8-5 LINE	8-5 LINE	8-5 LINE	8-5 LINE	OFF	OFF
Nicholas Fisher	8-5 LINE	8-5 LINE	8-5 LINE	8-5 LINE	OFF	OFF	OFF
Robert Anselmo	4-10 LINE	4-10 LINE	4-10 LINE	OFF	OFF	8-5 LINE	8-5 LINE
Nadira Barrett	OFF	OFF	OFF	4-10 LINE	4-10 LINE	4-10 LINE	4-10 LINE
Eton Grubbs	OFF	OFF	OFF	4-10 LINE	4-10 LINE	4-10 LINE	4-10 LINE

	Monday 3/27/2016	Tuesday 3/28/2016	Wednesday 3/29/2016	Thursday 3/30/2016	Friday 3/31/2016	Saturday 4/1/2016	Sunday 4/2/2016
Rebecca Carey	6-2 PIC	6-2 PIC	OFF	OFF	6-2 PIC	6-2 PIC	6-2 PIC
Jack Foley	OFF	1-10 PIC	1-10 PIC	1-10 PIC	1-10 PIC	1-10 PIC	
Hilary Radcliff	1-10 PIC	OFF	6-2 PIC	6-2 PIC	OFF	OFF	1-10 PIC
Jenny Costella	OFF	OFF	6-2 PREP	OFF	6-2 PREP	OFF	OFF
Ryan Zert	OFF	1-9 PREP	OFF	6-2 PREP	OFF	6-2 PREP	6-2 PREP
Peter Donovan	OFF	OFF	OFF	1-9 PREP	1-9 PREP	1-9 PREP	1-9 PREP
Sharon Daugherty	1-9 PREP	OFF	1-9 PREP	OFF	6-2 PREP	6-2 PREP	OFF
Martin Vasquez	8-5 LINE	OFF	OFF	OFF	8-5 LINE	8-5 LINE	8-5 LINE
Joe Kendall	OFF	OFF	8-5 LINE	8-5 LINE	8-5 LINE	OFF	OFF
Nicholas Fisher	OFF	OFF	8-5 LINE	8-5 LINE	OFF	OFF	OFF
Robert Anselmo	4-10 LINE	4-10 LINE	4-10 LINE	OFF	OFF	8-5 LINE	8-5 LINE
Nadira Barrett	OFF	OFF	OFF	4-10 LINE	4-10 LINE	4-10 LINE	4-10 LINE
Eton Grubbs	OFF	OFF	OFF	4-10 LINE	4-10 LINE	4-10 LINE	4-10 LINE

List of Abbreviations:

- **PIC:** Person-In-Charge
- **PREP:** Meal preparation
- **LINE:** Meal production

Appendix C: Environmental Assessment Report

Facility: Hyperion Hotel
Facility Type: Commercial FSO
Inspection Type: Outbreak
Inspection Date: 03/30/2016

Comments:

Critical Control Comments – Employee Health-Facility excludes workers with illness symptoms. Facility requires workers to have a doctor's excuse to return to work. PIC is aware of reportable diseases.

Personnel Cleanliness – All food employees wore clean clothing. Observed kitchen employees wearing proper hair restraints.

Handwashing – Facility has hand washing policy. Observed hand sinks properly stocked with hot and cold water, soap, paper towels, hand washing sign, and trash can.

Cross Contamination – Observed proper segregation of raw meat products and ready-to-eat foods.

Cooking – PIC reports all foods are cooked to proper cooking temperatures. Facility offers undercooked hamburgers with appropriate consumer advisory.

Thawing – PIC states that food is thawed under refrigeration.

Cooling – PIC states that no food is cooled.

Reheating – PIC states that no food is reheated.

Cold Holding – Foods held should be stored at 41°F or below. Facility has a corporate HACCP plan that is now in place. Temperatures are logged every two hours.

Hot Holding – Foods held should be stored at 140°F or above. Temperatures are logged every two hours.

Source – All food is from approved corporate supplier.

Date Marking – All food was properly date-marked.

Dishwashing – The three-compartment sink was properly set up. Test strips were available. Mechanical dishwasher is working properly.

Thermometer – Probe thermometer was available.

Highly Susceptible Population – Facility does not serve a highly susceptible population.

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This case study was developed by the Colorado Integrated Food Safety Center of Excellence in collaboration with the original investigators. Some aspects of the outbreak investigation have been altered for the purposes of this case study. Additionally, the methods utilized in this case study reflect the approach used for this particular outbreak. Outbreak response procedures, policies, and methods may vary by country, state, or local jurisdiction.

The Colorado Integrated Food Safety Center of Excellence (CoE) is a collaborative partnership between the Colorado Department of Public Health and Environment (CDPHE) and the Colorado School of Public Health (CSPH), one of five Integrated Food Safety Centers of Excellence designated by the Centers for Disease Control and Prevention (CDC). We are dedicated to identifying and developing model practices in foodborne disease surveillance and outbreak response. We provide trainings, continuing education opportunities, and serve as a resource for local, state, and federal public health professionals who respond to foodborne illness outbreaks. Learn more at www.COFoodSafety.org