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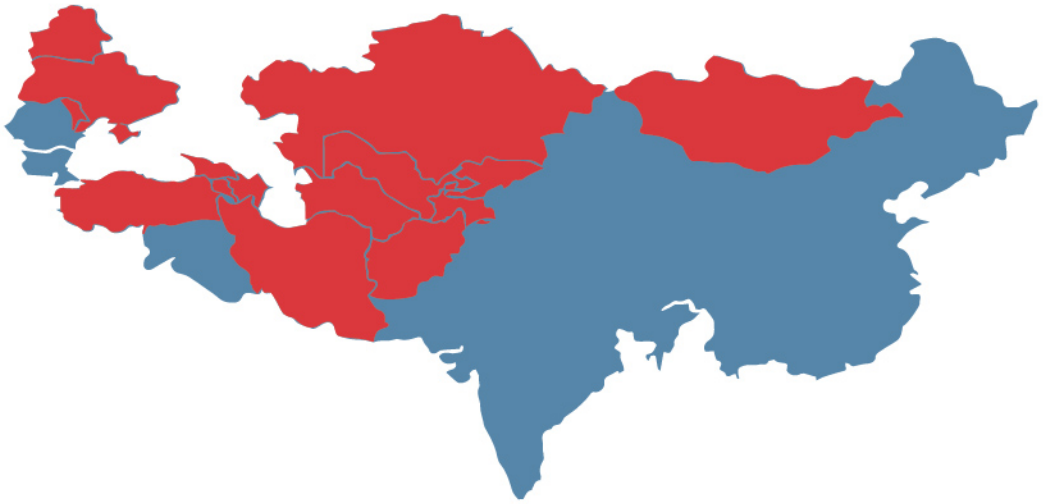
Dr. Yasir Y. Majeed, Dr. Zainab N. Abbas, Dr. Abdulrazzaq Mohammad, Dr. Hanan Khaleel

Learning from Practice: Public Health Teaching Case Studies from Eastern Europe and Central Asia



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Gastroenteritis at an Internal Displaced Persons IDPs Camp in Mosul, Iraq, 2017

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Note: This case study is based on a real-life outbreak investigation undertaken in Nineveh, Iraq in 2017. Some aspects of the original outbreak and investigation have been altered, however, to assist in meeting the desired teaching objectives and allow completion of the case study in less than 3 hours.

Students should be aware that this case study describes and promotes one approach to foodborne disease outbreak investigation. Procedures and policies in outbreak investigations, however, can vary from country to country, state to state, and outbreak to outbreak.

How to Use the Case Study

General instructions: This case study should be used as adjunct training material for the Novice FETP trainees to reinforce the concepts taught in prior lectures. The case study is ideally taught by a facilitator in groups of about 20 participants. Participants are required to take turns reading the case study, usually a paragraph per student. The facilitator guides the discussion on possible responses to questions. The facilitator may make use of flip charts to illustrate certain points. Additional instructor's notes for facilitation are coupled with each question in the instructor's guide to aid facilitation.

Audience: This case study was developed for novice field epidemiology students. These participants are commonly health care workers working in the county departments of public health whose background may be medical doctors, dentist, pharmacist, medical technician, and veterinarian who work in public health-related fields. Most have a health science or biology background.

Prerequisites: Before using this case study, participants should have received lectures on disease surveillance and outbreak investigation.

Materials needed: Flip charts, Markers, Computers with MS Excel, Papers and Calculator
Level of training and associated public health activity: Intermediate and Advanced FETP Residents

Time required: 2-3 hours
Language: English

Goal of Case Study: To build a qualified capacity of FETP trainees in the Outbreak investigation and in response to such health threats in future.

Learning Objectives – At the conclusion of the teaching session, participants will be able to:

1) Describe the initial steps of a field investigation of a possible outbreak.
2) Describe the components of a descriptive epidemiology analysis.
3) List the types of variables to include on an outbreak line list.
4) Calculate food-specific attack rates to determine which food item(s) might have caused disease.
5) List three common pitfalls in the collection of clinical specimens for the investigation of suspected foodborne diseases outbreak.
6) List key areas of focus in interviewing food handlers and observing kitchen practices in a foodborne disease.

Introduction/Background of the case study

Nineveh or Ninawa Governorate is in the northern Iraq. It has an area of 37,323 km² and an estimated population of 4,240,000 people. Its largest city and provincial capital are Mosul, which lies across the Tigris River from the ruins of ancient Nineveh. The river divided the city into two sides the right side and the left side. In 2014, Mosul fell under the control of ISIS terrorist gangs, which caused massive destruction to the city's infrastructure and killed many civilian residents, forcing residents to flee the city to other governorates or to camps for the displaced located in the cities neighboring to Nineveh governorate.

The Public Health Department at Nineveh Directorate of Health (DOH) responded to an urgent report regarding a cluster of individuals within the Hammam Al-Aleel Internally Displaced Persons (IDPs) camp exhibiting symptoms of vomiting, diarrhea and abdominal pain after their consumption of Iftar food in the evening. Hammam Al-Aleel camp was built at the beginning of 2017 in preparation to receive IDPs. It is located 15 km southern Mosul and composed of 500 tents.

Picture (1) located after this section.

Picture (2) located before this part.

Part 1: Story On June 13th, 2017, during the fasting period of Ramadan, a report was received by the public health specialist in the Public Health Department at Nineveh (DOH) in Mosul concerning a notable surge in patients exhibiting symptoms of diarrhea, abdominal pain, and vomiting at Hammam Al-Aleel Internally Displaced Persons (IDPs) camp in Mosul. This report was relayed by the Director of the Public Health Department in Mosul shortly after the Iftar time (07:30 pm), prompting immediate action.

Subsequently, the public health specialist in Mosul DOH, along with a general practitioner, promptly responded to the situation by traveling to Hammam Al-Aleel camp via ambulance, reaching the location at approximately 09:00 pm.

Hammam Al-Aleel camp, established in early 2017 to accommodate IDPs, is situated 15 km south of Mosul. The camp consists of 500 tents, each housing a family (with an average family size of 5 individuals), thereby accommodating a total of 500 families. The sanitation facilities at the camp included one bathroom for every 10 tents (equivalent to 10 families), and the camp lacked access to electricity. The water supply was facilitated by tanks.

Picture (3): The Map located here before continuing the story

Mosul DOH staff began by making a few telephone calls to establish the facts and determine if other persons were similarly affected. They discovered that on June 13th, a charitable organization prepared and distributed food for IDPs, all of them ate food at 07:30 pm, which is a fixed time (Iftar) due to Ramadhan.

Question 1: Do you think this health event should be investigated further? and why?

Answer:

Important Information:

The most important diseases/complaints to investigate are those that are a severe threat to the public's health (high mortality rate, high morbidity, unusual, suspected to be intentional, vulnerable population) or where a timely control response is critical.

Top priorities include:

- an outbreak associated with a commercially distributed food product
- severe (life-threatening) illnesses, such as, botulism or E. coli O157:H7 infection
- confirmed clusters of a similar illness that appear to be associated with a specific food preparer or food service establishment
- instances where many people appear to be affected
- indications of adulterated food presenting an imminent danger
- foodborne illness in a food-handler

- clues that a follow-up investigation may not be warranted or is unlikely to be productive include:
    - Signs and symptoms (or confirmed diagnoses) among affected individuals suggesting they might not have the same illness
    - Ill persons who are not able to provide adequate information for investigation including: date and time of onset of illness, symptoms, or a complete food history
    - Confirmed diagnosis and/or clinical symptoms that are not consistent with the foods eaten and the onset of illness
    - repeated complaints made by the same individual(s) for which prior investigations revealed no significant findings

In this foodborne disease complaint, one might be a little skeptical. First, if the illness was due to food consumed the night before, the incubation period would have been relatively short, suggesting a preformed toxin. The patients' symptoms (e.g., diarrhea), however, are more consistent with an enteric infection. Secondly, the patients refused to give the source of food.

<u>Question 2:</u> As a surveillance officer at the CDC, what is the most appropriate action that you should take now?

Answer:

<u>Question 3:</u> What steps do you need to follow to conduct an outbreak investigation?

Answer:

Further Explanation:

At this point of the investigation and as a response to a possible outbreak of foodborne illness, it is important to systematically collect the following information:

- **WHAT** is the patient's problem? (clinical description of the illness, whether a physician was consulted, whether any tests were performed, or any treatments were provided, the type of the tests and treatments provided and by whom)
- **WHO** else became ill, their characteristics (age, sex, occupation), and the nature of their illnesses (symptoms, whether any persons were hospitalized or died)?
- **WHEN** did the affected person(s) become ill? WHEN was their last meal?
- **WHERE** are the affected persons located? (Including names, telephone numbers, tent

- **WHY (and HOW)** do they think they became ill? (Risk factors, suspected exposures, suspected modes of transmission, hints from who else did and did not become ill

<u>Question 4</u>: Do you think these cases of gastroenteritis represent an outbreak at the IDPs camp? Why or why not?

Answer:

NOTE: The terms "outbreak" and "epidemic" are used interchangeably by most epidemiologists. The term "outbreak" is sometimes preferred, particularly when talking to the press or public, because it is not as frightening as "epidemic".

<u>Question 5</u>: What would you advise the patients about fasting that day and the coming few days?

Answer:

The patients were cooperative, but some of them hesitated from providing details about the source of the food.

Part 2 Methods

After arriving at the camp, both the public health specialist and the general practitioner visited the medical health center to review the available information and data. They found that the health center initially received 1 patient per hour, then 3-5 patients per hour over a period of 5 hours. Two teams were created; each team is composed of 2-3 members to start the investigation. We inform the Communicable Disease Control Center (CDC) director about the event in addition to the rest of the surveillance officers at the CDC.

On the evening of June 14, about 36 hours after the initial call to the Public Health Department, a retrospective cohort study was conducted. The "Foodborne Illness Complaint Worksheet" **(See Appendix A)** was completed based on the call; this worksheet was designed to collect information from the people at the Camp. The patients (reported to the health center) who could be reached at their tents were enrolled as cases. Other IDPs were interviewed and asked about the source of food, the food items they ate on June 12, and whether they became ill or not. All information was collected by interview in person.

Picture (4): located here before Ethical Considerations Section

Ethical Consideration:

The official approval obtained from Iraq Ministry of Health and from Ninevah Health Directorate to conduct this investigation

Verbal consent obtained from the patients before starting the interview with them and they informed that all the collected information will be used for research purposes only, and personal information collected with serial identification numbers without an identity for confidentiality.

Question 6: How are you going to proceed with the investigation?

Answer:

Question 7: What general types of information would you include in the questionnaire?

Answer:

Question 8: Investigators considered collecting information for the retrospective cohort study through face-to-face interviews or self-administered questionnaires. What are the advantages and disadvantages of each method of data collection? Which method would you recommend given the circumstances around the outbreak?

Answer:

A **case definition** was put for this outbreak, because initial laboratory tests among ill persons in this outbreak were not possible, the clinical component of the case definition will be based largely on signs and symptoms. Predominant symptoms among persons seen at the health center included "vomiting" and/or "diarrhea". Because humans naturally experience changes in bowel patterns (e.g., consistency and number) on a day-to-day basis, "diarrhea" among cases needs to be defined in such a way as to exclude as many well persons with these natural variations as possible

For this study, a case was **defined** as vomiting or diarrhea (> loose bowel movements during a 12-hour period) with onset on or after June 13, 2017, in a person living in Hammam Al-Aleel IDPs camp, seen at the health center in the camp or by the investigators.

Question 9: How would you define a case for this study?

Answer:

The teams started visiting all the families who ate the suspected meal, filled questionnaires for all patients and healthy persons regardless of what they ate for breaking fast (Iftar). At 03:00 am, the team finished their mission and started working on create a line list that included the following variables: Demographic information, Clinical information, Date of onset, Risk factors and the Laboratory test and food history.

Food samples were collected and sent to the lab. However, most of the samples were not transported according to the laboratory guidelines regarding sample collection and transportation because of the exceptional situation in that place at that time.

During the time of the outbreak, Mosul Peripheral Public Health Lab (PPHL) was not functioning due to security situation. Had it been functioning, then the lab would have been able to conduct testing for common GI pathogens and/or advise on proper specimen collection and transport to Central Public Health Lab (CPHL) or other identified laboratories for specialized testing.

Picture (5) located here before Question (10)

Question 10: Should you take samples from the patients? Why?

Answer:

Question 11: What tests you should ask the Peripheral Public Health Lab (PPHL) or Central Public Health Lab (CPHL) to perform?

Answer:

During that time between starting investigation and the end, both the public health specialist at the Mosul DOH and the surveillance officer at the CDC kept communicating with each other by phone to share information, data, ideas, and conclusions between each other. Data analyzed by using Microsoft excel.

Question 12: How are you going to ship and transfer the samples? Read Appendix B.

Answer:

Part 3: Results

After interviewing the people and asking them about their Iftar food and the food items they ate, we found that on June 12th, a charitable organization prepared and distributed Iftars for IDPs for breakfast at 07:30 pm. About 200 people ate the food, half of them developed signs and symptoms after 10 - 16 hours complaining of abdominal pain, nausea, vomiting and diarrhea in different severity. Before proceeding with the investigation, both teams met with the IDPs camp officials, no access to the charitable organization dining facility was granted. Therefore, Mosul DOH environmental sanitarians did not inspect the main facility where food was prepared nor interviewed the staff who prepared the food.

Question 13: What topics would you include in discussions with the IDPs camp officials?

Answer:

Question 14: How are you going to prepare the line list?

Answer:

By June 15th, ninety-eight persons with vomiting or diarrhea had been reported to Mosul DOH. All were people who lived in the camp. No cases were identified among the local community. The dates of illness onset were June 12th, 3:00 am till June 13th, 10:00 am. The median age of patients was 19 years (range: 18-22 years), 48.0% were freshman, and 52.0% were female (Table 1)

Question 15: From the information you have, can you draw Epi- Curve?

Answer:

Question 16: Using information available to you at this point, state your leading hypothesis(es) on the pathogen, mode of transmission, source of the outbreak, and period of interest.

Answer:

LEADING HYPOTHESIS: a bacterial infection/pre-formed toxin spread by a food or beverage served at the IDPs camp in June 12.

Question 17: What would you do next?

Answer:

Based on clinical findings, the descriptive epidemiology of early cases, and hypothesis generating, interviews investigators hypothesized that the source of the outbreak was a bacterial pathogen spread by a food or beverage served by the charitable organization on June 12th.

Question 18: What are the factors that may enhance contamination, survival, and growth of bacteria during food preparation? See the fact sheet in Appendix C.

Answer:

Food sample testing reveals isolation of staphylococcus aureus, bacillus cereus, and E-coli **(Read Appendix D to learn more about each bacterium)**

<u>Question 19:</u> What types of activities do you think you would undertake as part of an environmental health assessment on the chicken? What equipment would you want to have?

Answer:

<u>Question 20</u>: If there was access to the food preparation facility, what key areas should be explored during interviews with the food-handlers?

Answer:

<u>Question 21:</u> What action would you take regarding the dining facility of the charitable organization?

Answer:

<u>Question 22:</u> What are the advantages and disadvantages of undertaking a case-control study instead of a cohort study at this point in the investigation?

Answer:

About 200 exposed and non-exposed individuals were interviewed in the IDPs camp. Investigators tabulated the most notable results in (Table 2)

<u>Question 23</u>: How do you calculate the attack rate?

Answer:

Question 24: Calculate the Attack rate for each food item?

Answer:

Question 25: Calculate the appropriate measure of association?

Answer:

Question 26: Calculate the Relative Risk for each food item?

Answer:

Results show that there are three food items associated with increased risk of developing diarrhea among the IDPs, tests of statistical significance (such as the chi-square or Fisher exact test) are used to determine how likely it is that the observed relative risk could have occurred by chance alone if exposure was not actually related to the disease.

Question 27A: How do you interpret these findings?

Answer:

Question 27 B: What elements of this retrospective cohort study might affect the validity of the measured association?

Answer:

Mosul DOH invited staff from the Centers for Disease Control and Prevention (CDC) in Baghdad to participate in the ongoing investigation. One of the investigators was curious to detect if the

attack rate ratio varies by gender for any of the food items implicated in this outbreak. (Table 3&4)

<u>Question 28</u>: How do you think the investigator should analyze the data to detect if the attack rate ratio varies by gender for any of the food items implicated in this outbreak?

Answer:

Part 4: Discussion

<u>Question 29:</u> How do you interpret the results?

Answer:

<u>Question 30</u>: In writing your Press release, what's the criteria that should be considered? See Appendix E.

Answer:

<u>Question 31</u>: Critique the press release. How might the press release impact the outbreak investigation?

Answer:

Question 32: What is your press release going to be?

Answer:

Question 33: What is your conclusion?

Answer:

Table 1: Descriptive characteristics of the study sample.

	Total N (%)	Ill N (%)	Not ill N (%)
Age group	196 (100.0%)	98 (50.0%)	98 (50.0%)
1-10 yrs	51 (26.0%)	28 (28.6%)	23 (23.5%)
11-20 yrs	55 (28.1%)	29 (29.6%)	26 (26.5%)
21-30 yrs	43 (21.9%)	19 (19.4%)	24 (24.5%)
31-40 yrs	29 (14.8%)	15 (15.3%)	14 (14.3%)
41-50 yrs	10 (5.1%)	4 (4.1%)	6 (6.1%)
>50 yrs	8 (4.1%)	3 (3.1%)	5 (5.1%)
Gender			
Female	101 (51.5%)	51 (52.0%)	50 (51.0%)
Male	95 (48.5%)	47 (48.0%)	48 (49.0%)
Symptoms			
Abdominal pain			
Yes	77 (39.3%)	77 (78.6%)	0 (0.0%)
No	119 (60.7%)	21 (21.4%)	98 (100.0%
Vomiting			
Yes	86 (43.9%)	86 (87.7%)	0 (0.0%)
No	110 (56.1%)	12 (12.2%)	98 (100.0%)
Diarrhea			
Yes	87 (44.4%)	87 (88.8%)	0 (0.0%)
No	109 (55.6%)	11 (11.2%)	98 (100.0%)

Table (2): Illustrate the frequency of diarrhea among IDPs according to the food item eaten								
	Ate				Did not eat			
Food items	ill	not ill	Total		ill	not ill	Total	
Chicken	86	66	152		12	32	44	
Rice	87	81	168		11	17	28	
Bean soup	95	66	161		3	32	35	
Canned food	36	48	84		62	50	112	
Ice	52	65	117		46	33	79	
Yogurt	13	17	30		85	81	166	
Bread	56	62	118		42	36	78	
Vegetable	44	64	108		54	34	88	

Table 3: Male in the IDPs who involved in the study:

	Ate			**Did not eat**		
Food Items	**ill**	**Not- ill**	**Total**	**ill**	**Not- ill**	**Total**
chicken	42	31	73	5	17	22
rice	42	41	83	7	5	12
Bean soup	47	34	81	0	14	14
Canned food	20	22	42	27	26	53
ice	26	32	58	21	16	37
Yogurt	5	9	14	42	39	81
Bread	31	27	58	16	21	37
Vegetable	24	33	57	23	15	38

Table 4: Female in the IDPs who involved in the study:

	Ate			**Did not eat**		
Food Items	**ill**	**Not- ill**	**Total**	**ill**	**Not- ill**	**Total**
chicken	44	35	79	7	15	22
rice	45	40	85	6	10	16
Bean soup	48	32	80	18	3	21
Canned food	16	26	42	35	24	59
ice	26	33	59	25	17	42
Yogurt	8	8	16	43	42	85
Bread	25	35	60	26	15	41
Vegetable	20	31	51	31	91	50

APPENDIX A: FOODBORNE ILLNESS COMPLAINT WORKSHEET

Demographic Information:

Name: Age: Sex: Occupation:
Location:

Clinical Information:

Date of onset: Date time:
Do you have any of the following?
Nausea Vomiting Abdominal pain Fever Bloody stool Headache
Other symptoms:

Medical help received: Yes No

Stool specimens taken: Yes No

Food history: (can be modified according to the history of food items provided at each event)

Rice Soup Salad Beans Soup Chicken Water Bread
Vegetables Ice

APPENDIX B: COLLECTION, HANDLING, AND TRANSPORT OF FECAL/ STOOL AND RECTAL SAMPLES STANDARD OPERATING PROCEDURE (SOP) TEMPLATE

Purpose

Stool (fecal) samples are collected for a variety of clinical diagnostic tests. They are most useful if collected soon after onset of diarrhea (for viruses < 48 hours, and for bacteria < 4 days), and preferably before the initiation of antibiotic therapy.

Rectal swabs may be necessary for fecal collection from small children, debilitated patients and other situations where passed stool sample is not feasible.

Responsibilities

Staff Responsibilities

Refer to the Laboratory Quality Manual and Biosafety Manual for general staff roles and responsibilities regarding the proper and safe execution of laboratory testing. In addition, refer to applicable local and national regulations, standards, or guidelines and ensure compliance.

Specific Safety Requirements and Responsibilities

Explicitly identify any safety hazards, along with proposed mitigations that are involved in the safe execution of this SOP. *{Example would be special handling of reagents or chemicals or need for special equipment such as fume hood that is specific to this SOP.}*

{If specific biowaste and chemical disposal procedures apply to this SOP, state them here}

SAMPLE HANDLING

Universal safety precautions consider all human samples as potentially infectious and/or biohazardous. Workers must utilize appropriate precautions when handling stool and rectal samples. Safety measures protect the patient, the person collecting the sample, and reduce the risk of contaminating the sample. *{Refer to country specific guidelines for the handling of Biohazardous material.}*

REAGENTS - MATERIALS/SUPPLIES – EQUIPMENT

This section lists all materials/supplies/equipment used for this procedure. *{The laboratory supervisor replaces each item in this category with applicable brand names as selected for the facility. In some cases, the laboratory manager may elect to produce supplies listed as substitutable with ones made in-house (ex: bleach or media).}*

Note—If reagents are substituted, they must be put through verification or validation procedures, as applicable.

{The laboratory might want to cross-reference other SOPs that give instructions for ordering supplies.}

Materials/Supplies/Equipment

- clean wide-mouth dry container to collect sample
- sterile leak-proof screw-capped container with transport media (as test requires)
- clean wide-mouth screw-capped or leak-proof container without preservative
- disposable plastic spoon or tongue depressor, wooden applicator sticks
- lab coat, disposable gloves, and additional PPE as needed, based on risk assessment
- sterile swab with transport medium (e.g., Amies or Stuart's media)
- labels and permanent marker
- transport container
- sharps container
- disinfectant (minimum of 0.5% sodium hypochlorite solution or equivalent disinfectant) *{Refer to country-specific biosafety policy}* (See SOP 3-01-001 for preparation instructions)
- biohazardous waste bags

PROCEDURE

IV. Preparation of Equipment and Laboratory Work Area

A. Review sample requirements before beginning collection procedures.

1. Diagnostic testing of different diseases may require samples with different volumes or collection in different types of containers. Prior to collecting samples, check the Laboratory Sample Collection Handbook (SOP 1-00-001) or specific disease testing protocol for sample collection requirements.
2. Collect samples soon after onset of diarrhea (for viruses < 48 hours, and for bacteria < 4 days), and preferably before the initiation of antibiotic therapy.
3. Loose or diarrheal stools are the recommended samples for testing.

4. Rectal swabs are not recommended for the diagnosis of viruses.
5. Samples must not be contaminated with urine or toilet water. Do not submit samples mixed with urine, water, barium, or castor oil.

B. Use appropriate personal protective equipment (PPE) including wearing gloves, laboratory coat, and other protection as indicated by risk assessment.
C. Verify patient identity and tests ordered.
D. Assemble the collection supplies and requisition form.
E. Explain the collection procedure to the patient.

B. Procedural steps

If Collecting Stool Sample:
Instruct the patient to pass the stool directly into a clean container, or collect sample in a clean bed pan, or use plastic wrap placed between the toilet seat and the bowl. Use the disposable spoon or tongue depressor to transfer 10 mL of liquid stool or walnut-size stool sample into the container. It is important to transfer feces from different areas and especially those areas that contain visible blood or mucus. For bacterial culture: use an applicator stick to mix thoroughly with the transport medium. For antigen detection and PCR: add fresh stool to a sterile screw-capped container. Discard the remainder of the sample and the original container as per institute specific biohazard protocols. Label the samples, noting the time of collection and anything else pertinent to the particular collection. Deliver sample to the laboratory.
If Collecting Rectal Sample:
DO NOT use any type of lubricant. Moisten 2 swabs in transport medium. Insert swab 1-1.5 inches into rectum and gently rotate. The swab must show fecal material. Place both swabs into the same tube deep enough that transport medium covers the cotton tips. Label the samples, noting the time of collection and anything else pertinent to the particular collection. Deliver sample to the laboratory.

Clean up

- Clean and disinfect the work area.
- Discard biohazardous wastes according to country and institute specific protocol.
- Discard applicator sticks in the sharp's container.

Storage/Transport of Samples

1. Stool:
   - Unpreserved stool: If <1 hour transport time, deliver in the clean container; store on cold packs/wet ice (4-8º C) for up to 24 hours.
   - Samples in transport media may be held at room temperature (20-25ºC); transport on cold packs/wet ice (4-8º C).
   - Store a portion of each stool sample for antigen detection or PCR testing frozen at ≤ -15ºC.
2. Rectal swabs: Refrigerate swabs in transport media at 4°C. Store on cold packs/wet ice, and transport as soon as possible.
3. For additional instructions on packaging and shipping samples to the laboratory, refer to the Laboratory Sample Collection Handbook (SOP 1-00-001).

RECORDING

Record sample collection and transport information in facility specific sample tracking logbook.

ATTACHMENTS

Facility-specific attachments can be included here. Examples of attachments are:

- background information pertinent to the SOP.

- screenshots embedded in procedure that are too large/distracting to go into the text.

APPENDIX C:

Fact Sheet:

The factors in the Table below, often found in the environmental health assessments have been associated with an increased risk of foodborne disease.

Table 3: Environmental Factors Associated with Foodborne Disease

Contamination	Survival	Growth
raw foods that are contaminated **infected food-handler** **unclean equipment** **cross-contamination** **contaminated foods eaten raw or lightly cooked** **inappropriate container for food** **unsafe sources** **added poisonous chemicals** **natural toxicant** **poor dry-storage practices**	inadequate cooking inadequate reheating inadequate acidification	inadequate refrigeration improper cooling inadequate hot-holding preparation too far in advance of serving use of leftover foods inadequate acidification high water content inadequate curing salt environment that provides favorable conditions for pathogen (e.g., anaerobic packaging)

APPENDIX D:

Fact Sheet:

Staph food poisoning is a gastrointestinal illness caused by eating foods contaminated with toxins produced by the bacterium *Staphylococcus aureus* (Staph) bacteria. As a group of Gram-positive, facultative aerobic, frequently unencapsulated, osmotolerant microorganisms, staphylococci are carried, mostly transiently, by approximately 50% of healthy adults on the skin and anterior nares and widespread in untreated water, raw milk, and sewage.

S. aureus is salt tolerant and can grow in sausages and salted beef. As S. aureus multiplies in fo od, they generate enterotoxins. Staphylococcal enterotoxins are heat-resistant and are not inactivated by cooking.

Staph food poisoning is characterized by a sudden start of nausea, vomiting, and stomach cramps. Most people also have diarrhea. Symptoms usually develop within 30 minutes to 8 hours after eating or drinking an item containing Staph toxin, and last no longer than 1 day. Severe illness is rare. The illness cannot be passed from one person to another.

Bacillus cereus is a type of bacteria known to cause certain types of food poisoning. Cases of Bacillus cereus food poisoning can be divided into two categories. The first type of B. cereus food poisoning is usually contracted through contaminated starchy food, including potatoes, pasta, and rice. The symptoms of this type of Bacillus cereus poisoning usually begin a couple of hours after contaminated food is ingested (incubation period= 30 min-6 hrs). Symptoms usually include nausea and vomiting, due to emetic toxin, and they typically only last several hours.
Fried Rice Syndrome is an excellent example of this type of Bacillus cereus food poisoning. Rice is often contaminated with this type of bacteria, if it is not refrigerated properly after being steamed as the bacteria thrives and multiplies rapidly.

Escherichia coli (E. coli) are bacteria that live in human and animal intestines. Shiga toxin-producing strains of *E. coli*, or STECs, are responsible for most food-related *E. coli* infections. *E. coli* O157:H7 and other STECs like E. coli O145 and E. coli O121:H19 produce a toxin called Shiga toxin, which causes illness in humans. *E. coli* bacteria do not make animals such as livestock and deer, which harbor the bacteria in their intestines, ill. The incubation period ranges from 1-10 days.

E. coli O157:H7 is mostly found in cows, although chickens, deer, sheep, and pigs have also been known to carry it. Meat becomes contaminated during slaughter, when infected animal intestines or feces meet the carcass. Ground or mechanically tenderized meats are considered riskier than intact cuts of meat because *E. coli* bacteria, can be mixed throughout the meat in the grinding process or during tenderization.

Other foods that sometimes become contaminated with *E. coli* bacteria include unpasteurized milk and cheese, unpasteurized juices, radish sprouts, lettuce, spinach, and contaminated water, including drinking untreated water and swimming in contaminated water. However, any food is at risk of becoming contaminated with *E. coli* through cross-contamination. One can also get *E. coli* bacteria from contact with feces of infected animals or people.

The worst type of *E. coli*, known as *E. coli O157:H7*, causes bloody diarrhea and can sometimes cause kidney failure and even death. *E. coli* O157:H7 makes a toxin called Shiga toxin and is known as a Shiga toxin-producing *E. coli* (STEC). There are many other types of STEC, and some can make you just as sick as *E. coli* O157:H7.

One severe complication associated with *E. coli* infection is hemolytic uremic syndrome (HUS). The infection produces toxic substances that destroy red blood cells, causing kidney injury. HUS can require intensive care, kidney dialysis, and transfusions.

APPENDIX E:

Fact Sheet:

In developing a press release, it is important to consider both in-house procedures and the politics of the broader public health and medical community. The MOH should not unilaterally distribute a press release but should consult with a variety of persons and agencies to make them

aware of the situation, take advantage of their expertise and resources, and gain their support in addressing the outbreak, if necessary. Persons/agencies to notify include:

- The Minister of Health (and other appropriate supervisors within the Ministry)
- Communications/public relations staff at the MOH
- Staff at the public health laboratory who may be involved in testing of clinical or food specimens
- The local health department
- Management of the charitable organization
- Professional groups (e.g., educational bodies, university staff)
- National public health authorities and reference laboratories (e.g., the Mosul PHL and CPHL)
- Food regulatory agencies (e.g., Health inspection department)

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