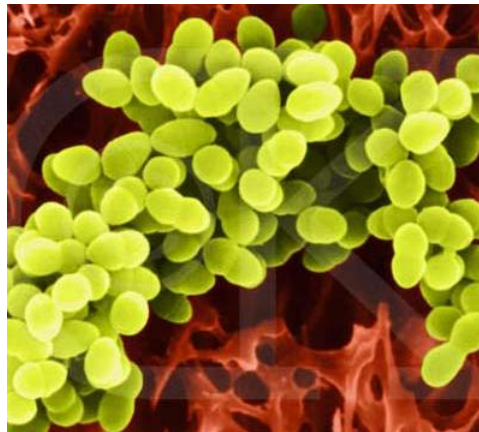
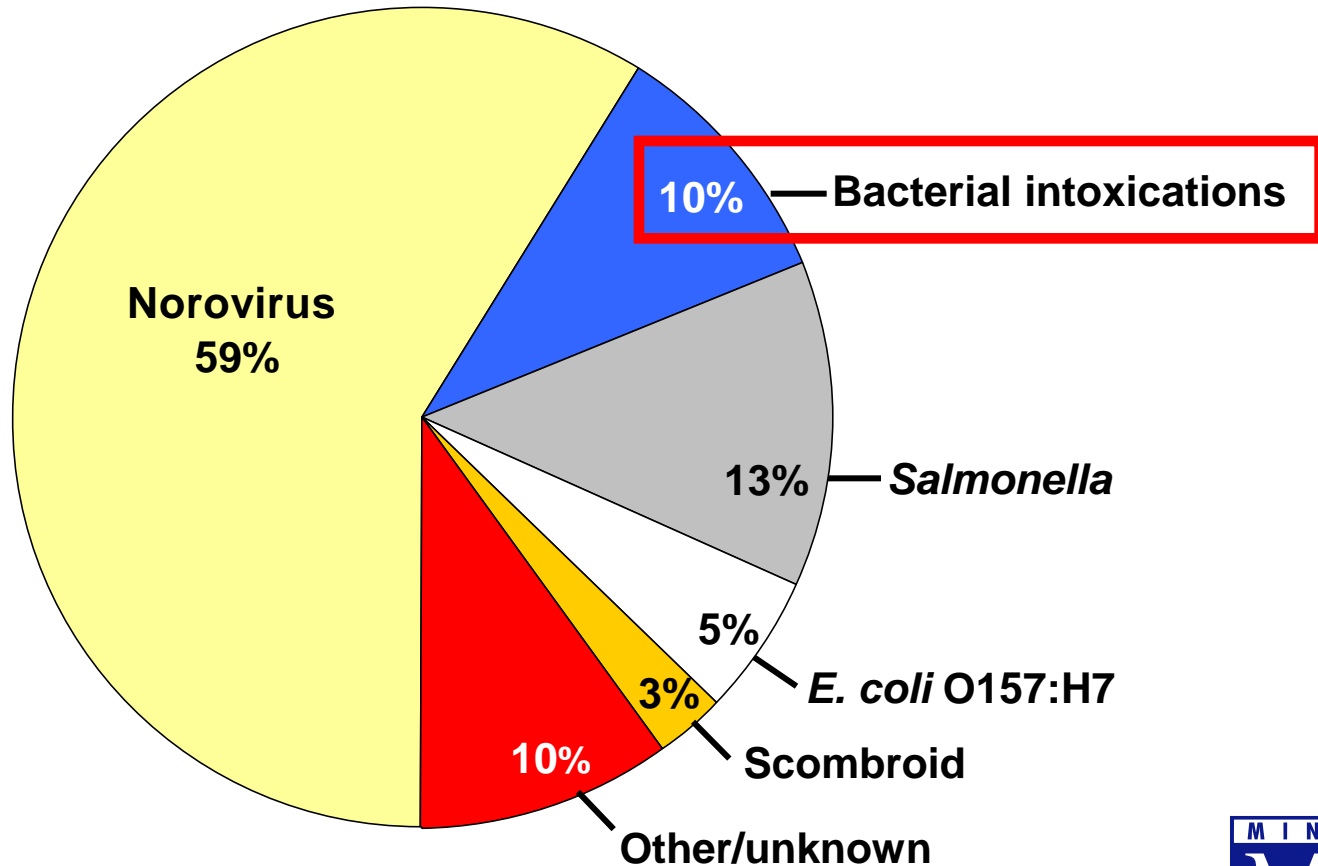


FOODBORNE BACTERIAL INTOXICATIONS

Josh Rounds, MPH
Epidemiologist
Minnesota Department of Health



Confirmed Foodborne Outbreaks by Etiology, Minnesota, 1999-2010 (n=600)



Etiologies of Confirmed Foodborne Outbreaks, Minnesota, 2010 (n=69)

Pathogen	No.	(%)
Norovirus	39	(57%)
<i>Salmonella</i>	13	(19%)
<i>E. coli</i> O157:H7	4	(8%)
<i>Clostridium perfringens</i>	2	(3%)
<i>Vibrio</i>	2	(3%)
Suspected bacterial toxin	2	(4%)
Scombroid toxin	1	(1%)
Non-O157 STEC	1	(1%)
<i>Campylobacter jejuni</i>	1	(1%)
<i>C. jejuni</i> + <i>Cryptosporidium</i>	1	(1%)
Unknown	3	(4%)

Etiologies of Confirmed Foodborne Outbreaks, Minnesota, 2010 (n=69)

Pathogen	No.	(%)
Norovirus	39	(57%)
<i>Salmonella</i>	13	(19%)
<i>E. coli</i> O157:H7	4	(8%)
<i>Clostridium perfringens</i>	2	(3%)
<i>Vibrio</i>	2	(3%)
Suspected bacterial toxin	2	(3%)
Scombroid toxin	1	(1%)
Non-O157 STEC	1	(1%)
<i>Campylobacter jejuni</i>	1	(1%)
<i>C. jejuni</i> + <i>Cryptosporidium</i>	1	(1%)
Unknown	3	(4%)

Minnesota Foodborne Illness Hotline

**Call to report
foodborne illness**

Toll free statewide:

1- 877- 366-3455

1- 877- FOOD ILL



717 Delaware Street
Minneapolis MN 55404
www.health.state.mn.us

- **Centralized at State Health Department**
- **Coordinated by one person**
- **Complaints received from public directly or from public via local health departments**

Foodborne Illness Report
Minnesota Department of Health
Phone: (651) 201-5414 Fax: (651) 201-5082

Stool kit delivered
 Daily

Complaint date: ___/___/___ Hotline call: How you got # _____ Tennessee:

Agency: Minnesota Department of Health Reporter: Dawn Kaehler

First Name: _____ Last Name: _____ Age: _____ Female Male

Address: _____ Zip: _____ Email: _____

Home phone: (____) _____ Work phone: (____) _____ Cell: (____) _____

Establishment that the complainant suspects: _____

Number of persons exposed: _____ Number ill: _____

Did complainant call the establishment? : Y N If yes, who did they speak with: _____

**If a retail food product is suspected, please fill out page 4 (Retail Food Product Complaint) in addition to the 4-day food history*

ILLNESS HISTORY Illness Onset: ___/___/___ Time: _____ Recovery: ___/___/___ Time: _____

Vomiting Y N Onset: ___/___/___ Time: _____ Recovery: ___/___/___ Time: _____

Diarrhea Y N Onset: ___/___/___ Time: _____ Recovery: ___/___/___ Time: _____

of stools per 24-hr. period (max): _____ Cramps Y N Fever Y N (temp: ___) Bloody stools Y N

Other symptoms: _____ Visited health care provider Y N

If yes, name and location: _____ Date of visit: ___/___/___

Provider requested stool sample Y N If yes, date stool submitted: ___/___/___ Hospitalized Y N

FOOD HISTORY

*If only one person is ill or if all ill persons live in same household, complete the entire four-day food history.
If more than one person is ill and they live in different households, record only the common meals.*

Meal Time	Date: ___/___/___ (work backward starting with onset date)	Hours to Illness Onset
<u>Brk:</u> _____	location: _____ food/drinks: _____	_____

<u>Lun:</u> _____	location: _____ food/drinks: _____	_____

<u>Sup:</u> _____	location: _____ food/drinks: _____	_____

<u>Other:</u> _____	location: _____ food/drinks: _____	_____

-Page 1-

Meal Time	Date: ___/___/___	Hours to Illness Onset
<u>Brk:</u> _____	location: _____ food/drinks: _____	_____

<u>Lun:</u> _____	location: _____ food/drinks: _____	_____

<u>Sup:</u> _____	location: _____ food/drinks: _____	_____

<u>Other:</u> _____	location: _____ food/drinks: _____	_____

Meal Time

Date: ___/___/___

Hours to
Illness Onset

Brk: _____ location: _____ food/drinks: _____

Lun: _____ location: _____ food/drinks: _____

Sup: _____ location: _____ food/drinks: _____

Other: _____ location: _____ food/drinks: _____

Meal Time

Date: ___/___/___

Hours to
Illness Onset

Brk: _____ location: _____ food/drinks: _____

Lun: _____ location: _____ food/drinks: _____

Sup: _____ location: _____ food/drinks: _____

Other: _____ location: _____ food/drinks: _____

Complainant occupation: _____

Daycare exposure: Y N

Have you been swimming in the past 2 weeks: Y N If yes, where _____ Date: ___/___/___

Did you drink any well water in the past 2 weeks: Y N If yes, where _____

Any ill household members in the last week: Y N If yes, who _____ Date: ___/___/___

AGENCIES NOTIFIED MDH-EHS MDH-District Office MN Dept of Ag FDA USDA

Local Agencies: _____

Comments _____

HISTORY OF OTHERS ILL

Original Complainant's Name: _____

First name: _____ **Last name:** _____ **Age:** _____

Address: _____ **Phone:** _____

Illness Onset: ___/___/___ **Time:** _____ **Recovery:** ___/___/___ **Time:** _____

Vomiting Y N **Onset:** ___/___/___ **Time:** _____ **Recovery:** ___/___/___ **Time:** _____

Diarhea Y N **Onset:** ___/___/___ **Time:** _____ **Recovery:** ___/___/___ **Time:** _____

of stools per 24-hr. period (max): _____ **Cramps** Y N **Fever** Y N (temp: _____) **Bloody stools** Y N

Other symptoms: _____

Meals in common:

Incubation

Meal 1: location: _____ food/drinks: _____

Meal 2: location: _____ food/drinks: _____

Meal 3: location: _____ food/drinks: _____

Assessing Foodborne Illness Complaints

- Number ill
- Other common exposures?
- Do incubation and symptoms fit together?
- Get complete food history – complainant may not be targeting correct exposure
- Enter complaints into a database
 - identify independent complaints naming same establishment
 - compare to reportable disease interviews

Illness Characteristics of Cases Can Tell You What Type of Pathogen is Likely and Therefore How to Focus Environmental Health Assessment

- Median incubation
- Median duration of illness
- % with vomiting
- % with fever (and, how high were temps?)
- % with blood in stools

Clinical Syndromes and Outbreak Presentations

<u>Clinical Syndrome</u>	<u>Incubation</u>	<u>Cause</u>
Nausea, vomiting	1-6 hr	<i>S. aureus</i> toxins <i>B. cereus</i> emetic toxin
Abdominal cramps, watery diarrhea	6-24 hr	<i>B. cereus</i> enterotoxin <i>C. perfringens</i> enterotoxin

Foodborne Bacterial Intoxications

- These bacteria very commonly found on foods
- Somewhat frequent cause of outbreaks
- Short incubation (hours), short duration (hours to <2 days)
- Caused by time-temperature abuse of food
- No person-to-person transmission

Foodborne Bacterial Intoxications

- Challenges
 - Outbreaks are under-reported
 - Milder illness w/ short durations
 - Often difficult to confirm etiology
 - Pathogen/toxin is cleared quickly after recovery

Clostridium perfringens

- Spores survive normal cooking temperatures
- Germinate and multiply during slow cooling and/or inadequate rewarming
- Diarrhea (vomiting & fever usually absent)
- Incubation (6 – 24 hrs)
- Illness from the release of toxin by spore forming bacteria in the lower intestinal tract
- Common vehicles are meats or stews and gravies made from meats

Staphylococcus aureus

- Characterized by an abrupt & violent illness onset of nausea, cramps, and vomiting
- Incubation (30 mins – 6 hours)
- Enterotoxins are heat stable, the bacteria will multiply and produce toxins
- Sources include food-handlers with an exposed skin infection

Bacillus cereus

- Two forms (both with short incubations)
 - Vomiting toxin (1 – 6 hrs)
 - Heat stable
 - Produced on the food and ingested
 - Diarrhea toxin (6 – 24 hrs)
 - Heat liable
 - Produced in the small intestine
- Fried rice is a classic vehicle

Approach when Illnesses are Characteristic of Bacterial Intoxications

- Times and temperatures
 - Heating
 - Cooling
 - Reheating/hot holding
- Meats and gravies (*C. perfringens*), rice (*B. cereus*), salad dressings, custards, sliced meats (*S. aureus*)

Clostridium perfringens

- September 18: MDH learned of multiple calls (>20) to parish administrator reporting illness after attending church festival
- 3-day church festival the previous weekend
- Event was open to the general public
- As many as 1,000 people served at each of two main dinners
 - Taco dinner
 - Pork roast dinner

Clostridium perfringens

- 49 attendees/volunteers interviewed
 - 23 (47%) ill
- Median duration of illness, 13 hours (3 to 57 hours)
 - 100% diarrhea, 78% cramps, 9% fever
- Stool testing revealed that cause was *Clostridium perfringens*
- Outbreak vehicle: pork roast and gravy made with pork drippings

Clostridium perfringens

- 350 lbs. of pork loin cooked beginning at 9:00 pm on Saturday night
 - Not divided into smaller portions to facilitate cooling
 - Some stored at room temp. for hours
 - Placed in hot holding units for reheating, stored in chafing dishes for serving
 - Temps. never taken to ensure that proper cooling took place or that hot holding requirements were met

Clostridium perfringens

- Improper cooling procedures and improper hot- and cold-holding temperatures
 - Allowed bacteria to grow to high levels on food and to survive
- Food was not prepared by a certified food manager

Bacillus cereus

- February 16: MDH learned of multiple reports of illness among UMN staff
- Ate take-out food from a Chinese restaurant for lunch on February 15
 - Left-over food was stored in a refrigerator at the University and served again for lunch on February 16

Bacillus cereus

- 31 interviewed
 - 10 (32%) ill
- Median incubation period, 30 minutes (15 min to 3 hours)
 - 80% vomiting, 60% diarrhea, 50% cramps
- Median duration of illness, 19 hours (3 to 66 hours)
- Two vomit samples were positive for *Bacillus cereus* and contained emetic toxin

Bacillus cereus

- Eating foods served on the first day was not associated with illness
- However, eating leftover food on the second day was associated with illness
 - Consuming left-over fried rice was the only food item that remained associated with illness in logistic regression $p < 0.001$
- Left-over fried rice submitted to the laboratory contained *B. cereus* as well as emetic toxin

Bacillus cereus

- The left-over fried rice was improperly cooled at room temperature for an extended period of time
- Also the fried rice was improperly re-heated

Staphylococcus aureus

- June 6: MDH received a complaint regarding illness among graduation party attendees
- Grad party held on June 5
- Pulled pork & pulled beef from a restaurant served
- Homemade potato salad was also served

Staphylococcus aureus

- 64 interviewed
 - 13 (20%) ill
- Median incubation period, 4 hours (1 to 10 hours)
 - 92% vomiting, 77% diarrhea, 46% cramps
- Median duration of illness, 14 hours (1 to 25 hours)
- One stool specimen collected

Staphylococcus aureus

- Potato salad was the only food item associated with illness (13 of 13 cases vs 23 of 43 controls; $p = 0.002$)
- Potato salad was prepared at home
 - 40 lbs of potatoes were boiled, drained
 - Eggs hard boiled, cooled, peeled, and sliced
 - Food refrigerated overnight
- The fridge contents were reportedly warm the next morning when the salad was mixed

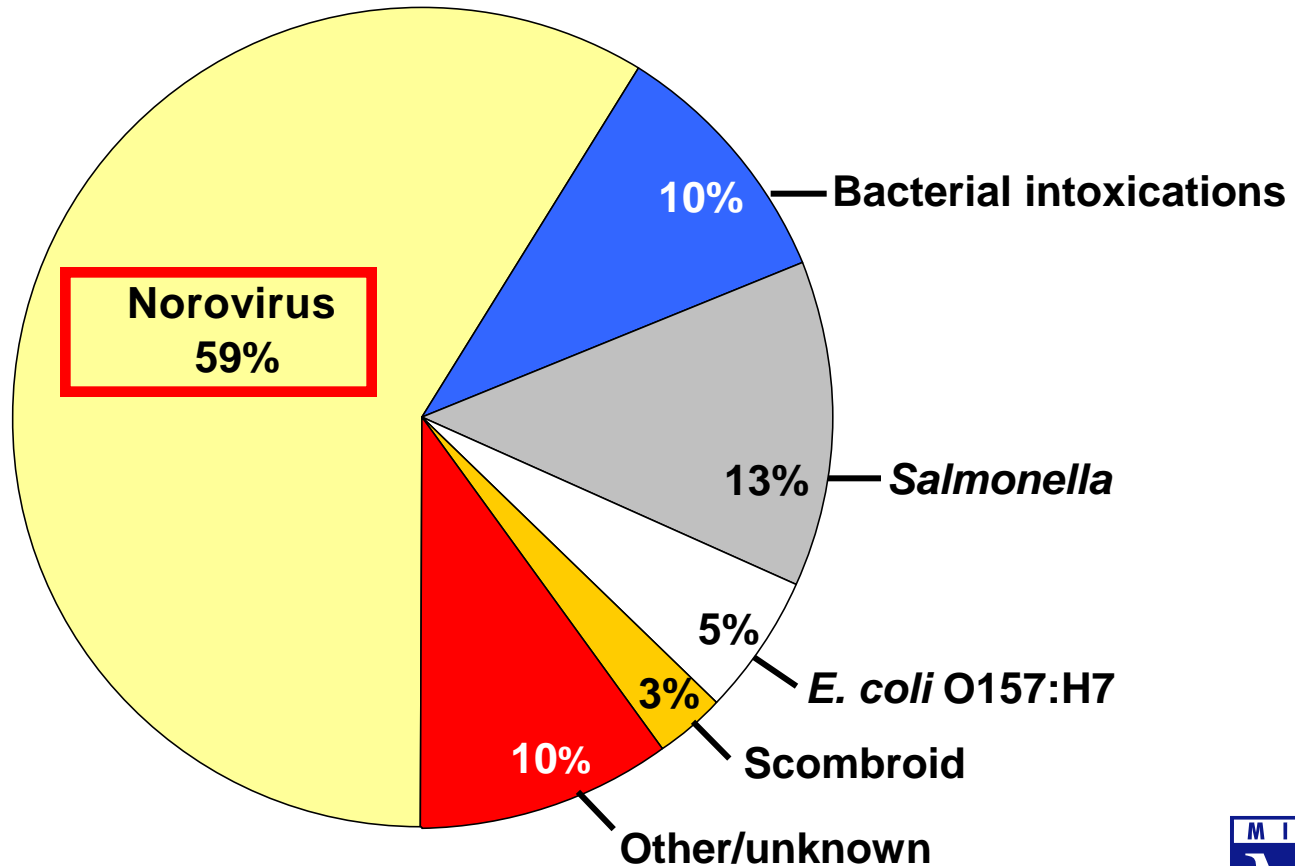
Staphylococcus aureus

- Left-over potato salad collected on June 7 from the fridge of the host of the party tested positive for *Staphylococcus aureus* enterotoxin A
- A sample of left-over peeled hard boiled eggs also tested positive for *Staph* enterotoxin A and the two isolates match by PFGE
- Stool specimen was negative for *Staph* but was collected on June 7 after patient had recovered

Norovirus

- #1 cause of acute gastroenteritis in U.S.
 - >20 million cases annually
 - 1 in 15 Americans become ill each year
- Median incubation period = 24-48 hours
- Median duration of illness ≤ 2 days
- Vomiting in $\geq 50\%$ of cases or vomiting more common than fever

Confirmed Foodborne Outbreaks by Etiology, Minnesota, 1999-2010 (n=600)



Etiologies of Confirmed Foodborne Outbreaks, Minnesota, 2010 (n=69)

Pathogen	No.	(%)
Norovirus	39	(57%)
<i>Salmonella</i>	13	(19%)
<i>E. coli</i> O157:H7	4	(8%)
<i>Clostridium perfringens</i>	2	(3%)
<i>Vibrio</i>	2	(3%)
Suspected bacterial toxin	2	(4%)
Scombroid toxin	1	(1%)
Non-O157 STEC	1	(1%)
<i>Campylobacter jejuni</i>	1	(1%)
<i>C. jejuni</i> + <i>Cryptosporidium</i>	1	(1%)
Unknown	3	(4%)

Approach when Illnesses are Characteristic of Norovirus

Areas to assess:

- **Food worker illness**
- **Handwashing**
- **Bare hand contact with ready-to-eat foods**
- **Cleaning/disinfection**
- **Do ready-to-eat foods need to be discarded?**
- **Does establishment need to be closed?**

Approach when Illnesses are Characteristic of Norovirus

- **Assess food worker illness**
 - **Ask manager (but never rely on that!)**
 - **Check employee illness log**
 - **Interview food workers**
 - **Can start with food workers involved in food prep on implicated date, but in full investigation is best to interview them all**
 - **Frequently can document transmission among food workers**

Employee Illness Log

Food Code requirements for employee health:

1. Food employees ill with vomiting or diarrhea should be excluded from working in the establishment.
2. This log should be completed when an employee has vomiting or diarrhea.
3. Restrict any food employees ill with *Salmonella*, *Shigella*, *E. coli*, or Hepatitis A from working with food, clean equipment, utensils, linens, or single-service items until the Health Department has evaluated the potential for food-borne disease transmission.
4. Call the City of Minnetonka Environmental Health Department at 952-939-8200 if an employee is diagnosed with one of the following; *Salmonella*, *Shigella*, *E. coli* or Hepatitis A.
5. Call the City of Minnetonka Environmental Health Department or 1877-FOOD-ILL if a customer complains of vomiting or diarrhea, or becomes infected with *Salmonella*, *Shigella*, *E. coli* or Hepatitis A.

MUST REPORT SYMPTOMS

Date Missed Work	Employee Name	Symptoms/Illness	Diarrhea or Vomiting?	Was Doctor Seen?	Date Returned To work
12-16-08	[REDACTED]			NO	12-17-08
12-16-08	[REDACTED]			NO	12-17-08
12-16-08	[REDACTED]			NO	12-16-08
1-8-09	[REDACTED]			NO	1-9-08
1-15-09	[REDACTED]	Flu	Dizziness Threw up	NO	1-16-09
1-16-09	[REDACTED]	Flu	upset stomach	NO	1-16-09
1-15-09	[REDACTED]	Flu		NO	1-16-09
1-15-09	[REDACTED]	Flu		NO	1-16-09
1-15-09	[REDACTED]	Flu		NO	1-16-09
1-16-09	[REDACTED]	Flu		NO	1-17-09
1-16-09	[REDACTED]	[REDACTED] (Ctrl) ▾		NO	1-17-09
1-19	[REDACTED]	Flu like symptoms	Throwing up Dizziness		
1-22	[REDACTED]	Flu / Diarrhea	Throwing up	NO	1-24-09

Approach when Initiating Outbreak Environmental Assessment (All Pathogens)

- **Outbreak assessments are not routine inspections!**
- **Meet with person in charge**
 - **Explain reason for investigation**
 - **Spell out steps that will be taken**
- **Obtain menu**
- **Request contact information for patrons from date(s) of interest**
 - **Stand firm!**

Approach when Illnesses are Characteristic of Norovirus

- **Interviewing food workers**
 - **Standard interview form**
 - **Template in protocol**
 - **Current or recent GI illness**
 - **Family members too**
 - **Should be done before begin next shift**
 - **Establishment management could use screening form as temporary solution**
 - **Duties (especially on implicated date)**
 - **Meals at establishment**

Consent Form
Outbreak Investigation

The Minnesota Department of Health, in conjunction with local public health, are conducting an investigation of a possible outbreak of foodborne illness that may be associated with _____. It is important for public health officials to determine the source of the outbreak so that transmission can be stopped. We can learn more about how transmission is occurring through interviewing persons who work in food service and **MAY** be asking that food service employees provide stool specimens. If any samples are collected, they will be tested for bacteria and viral pathogens at no charge to you. You will be provided with results once they are available. In addition we would like to ask you questions about any recent illnesses that you may have had and your work duties in food service at _____. If you have been ill or test positive for any pathogen that can be transmitted by food, it is important that you not return to work in food service for 72 hours after your recovery.

Results of the stool tests and any other information collected from you will be considered private data. Only public health officials from the Minnesota Department of Health who are directly involved in investigating this outbreak will have access to this information collected from you. In addition, because it may be important that you not return to work if you were ill until you recover, we are requesting your permission to share this information with management staff at _____.

You are not required to participate in this investigation. In addition, the information that you provide will improve our understanding of how this outbreak occurred and will help us to prevent any further transmission.

Do you have any questions? If all of your questions have been answered to your satisfaction, do you consent to providing a stool specimen to the Minnesota Department of Health if requested, and answering a brief questionnaire?

___ YES, I consent to providing a stool specimen

___ YES, I consent to answering a brief questionnaire

___ YES, the information about me obtained by the Minnesota Department of Health may be shared with management staff at _____.

Print name: _____

Date _____

Signature: _____

Interviewer Signature _____

Date _____

**MINNESOTA DEPARTMENT OF HEALTH
FOOD SERVICE EMPLOYEE QUESTIONNAIRE**

Tennesen: _____ Interview date: __/__/__ Interviewed conducted by: _____

Employee's Name: _____ Date of birth __/__/__ Female Male
 Address: _____ Phone: (____) _____
 Job title/description: _____
 Have you been ill with any of the following symptoms any time since _____ Yes No

Onset date: __/__/__ time (2400 hrs): _____ Recovery date: __/__/__ time (2400 hrs): _____ <input type="checkbox"/> Nausea <input type="checkbox"/> Vomiting (onset: __/__) <input type="checkbox"/> Cramps <input type="checkbox"/> Fever <input type="checkbox"/> Blood in stool <input type="checkbox"/> Diarrhea (# stools/24 hrs: _____) (onset: __/__) <input type="checkbox"/> Other _____ Did you submit a stool culture? Yes No Would you be willing to provide a stool culture? Yes No
--

Please list work schedule and all duties performed from: _____ to _____

<u>Date</u>	<u>Day of Week</u>	<u>Hours</u>	<u>Duties Performed</u>
__/__/__	M <u>T</u> <u>W</u> <u>Th</u> F S Su	_____ - _____	_____
__/__/__	M <u>T</u> <u>W</u> <u>Th</u> F S Su	_____ - _____	_____
__/__/__	M <u>T</u> <u>W</u> <u>Th</u> F S Su	_____ - _____	_____
__/__/__	M <u>T</u> <u>W</u> <u>Th</u> F S Su	_____ - _____	_____
__/__/__	M <u>T</u> <u>W</u> <u>Th</u> F S Su	_____ - _____	_____

What foods/beverages did you eat at the restaurant:

Do you work at any other food service facilities? If so, where and how often:

Have any members of your household been ill with diarrhea or vomiting since _____ Yes No
 What symptoms did they have? Nausea Vomiting (onset: __/__) Cramps
 Diarrhea (# stools/24 hrs: _____) (diarrhea onset: __/__) Fever Blood in stool
 Were any stool samples collected on ill family member(s)? Y N Results:

Management: Use one form for **EACH** employee. At the start of each shift, employee must complete form and initial. The manager/supervisor must sign off before the employee can begin work. These must be completed until the health department tells you to stop.

Employee Name: _____

Phone: _____

Establishment Screening Form



Date	In the last 24 hours, have you or anyone in your household experienced:				Employee Initials	Supervisor Initials
	Vomiting ¹	Diarrhea ¹	Fever ¹	Cramping ¹		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		
	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N		



* Employees with these symptoms must be excluded from work for at least 72 hours after symptoms resolve.

Approach when Illnesses are Characteristic of Norovirus

- **Exclusion of food workers**
 - **Until 72 hours after symptoms have resolved**
- **Testing of food workers**
 - **Ask to test ill food workers, but exclusion is not based on testing**

Approach when Illnesses are Characteristic of Norovirus

- **Do opened ready-to-eat foods need to be discarded?**
 - **Depends primarily on food worker illness**
 - **Many ill food workers?**
 - **Current illness?**
 - **Working while ill?**
 - **Bad handwashing, bare-hand contact practices?**

Approach when Illnesses are Characteristic of Norovirus

- **Does establishment need to be closed?**
 - **Is there ongoing risk to public if they don't?**
 - **Can they clean/disinfect, restock with food, and provide food workers who are known not to have current or recent symptoms?**

Questions