

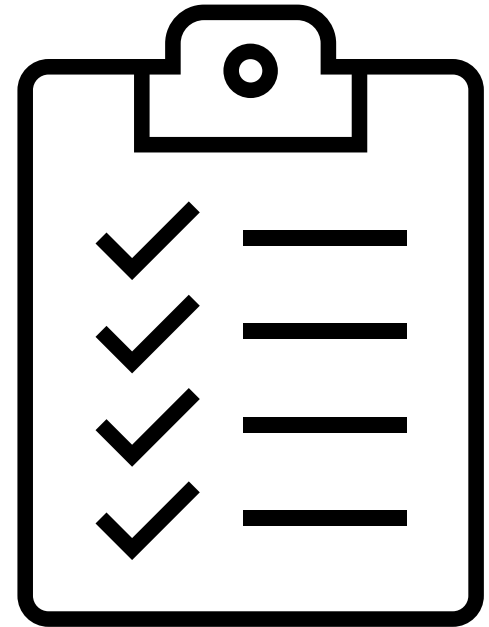


Investigating Norovirus Outbreaks at Retail Food Service Establishments

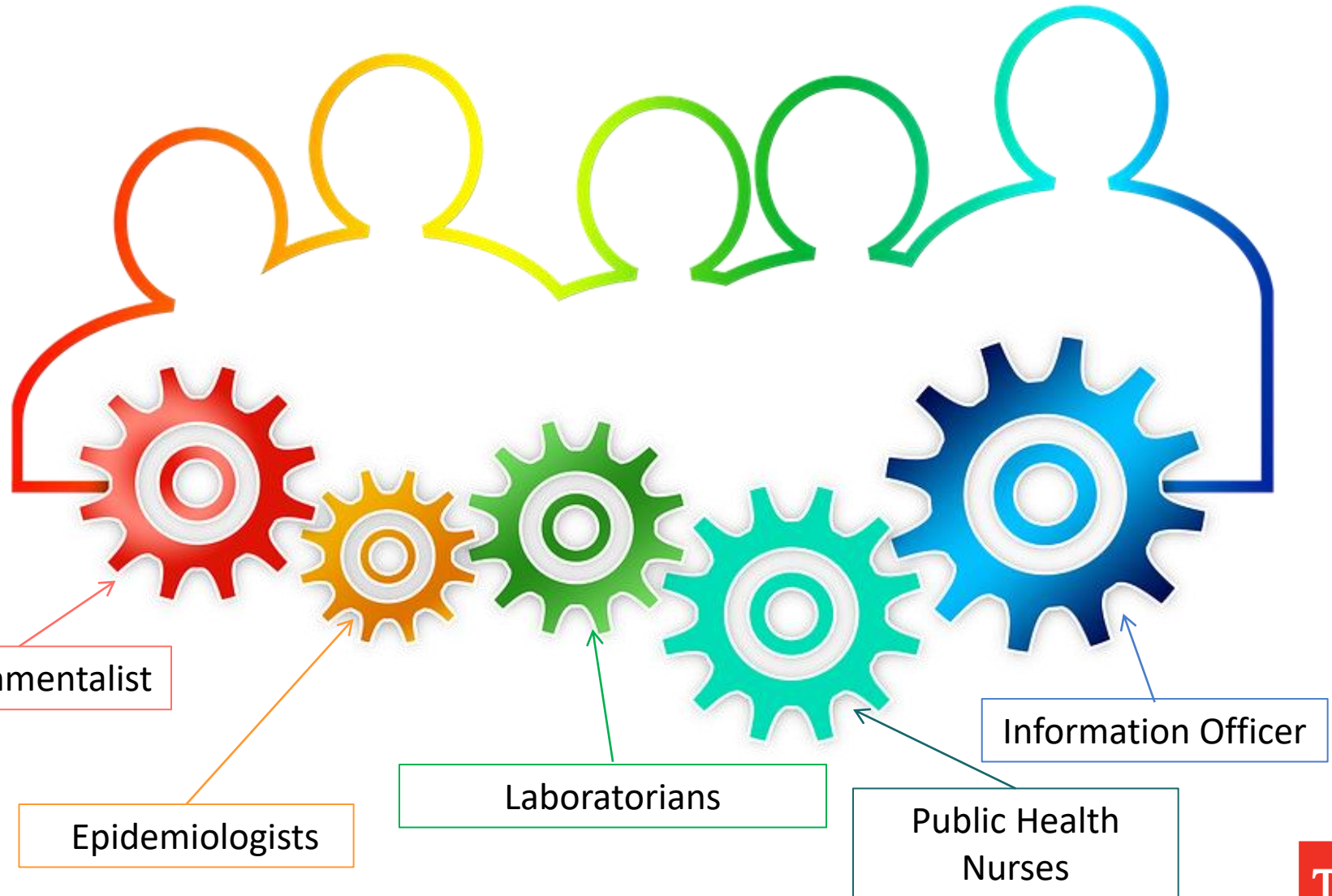
D.J. Irving, MPH, REHS
2021 AFDO Norovirus Best Practices Webinar
11/8/2021

Outline

- Outbreak Investigation Team
- Notification
- Developing Hypothesis
- Interview Questions
- Outbreak Example
- Control Measures



Who's on the outbreak team?

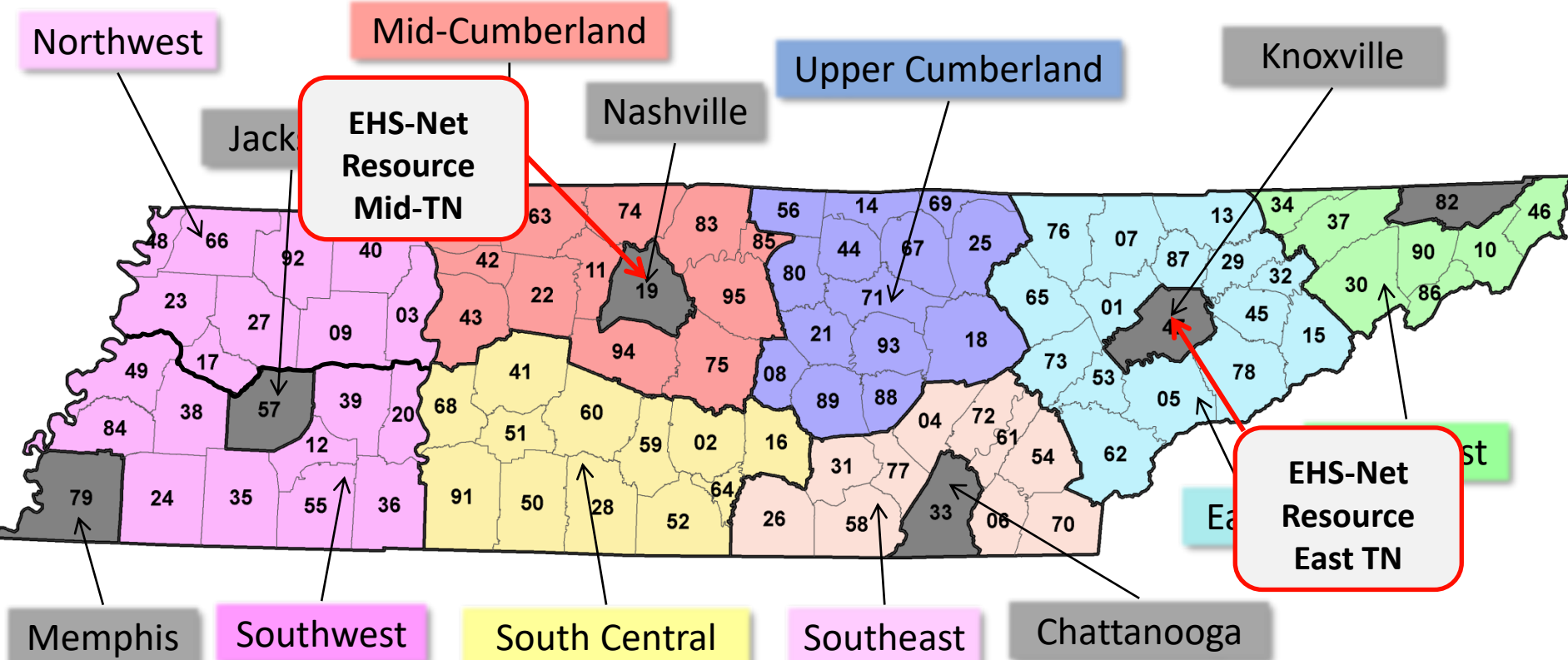


Who will investigate?

- Routine inspector?
- Supervisor?
- Specially trained outbreak investigator?
- Hybrid?



Who will investigate? (Tennessee Specific)



Counties	Regions	Contracts	Primary Contacts	Secondary Contacts	Population	FSE's	EHS's
96	8	5	13	23	6.9 Million	28,000	170

How are you notified?

- Complaint surveillance systems
 - Centralized
 - Agency specific
 - Account for more local outbreaks
 - Less detail prior to the site visit
- Pathogen surveillance systems
 - High level of pathogen information
 - Suspect vehicle may be provided
 - Greater delay in time prior to site visit

Foodborne Illness Complaint Form

Instructions for Interviewer: Please fill in the fields below with the information needed to submit a foodborne illness complaint. Interview prompts are in blue text. Required fields are marked with an asterisk. Any additional information collected could aid in investigation or follow-up activities. Thank you.

For Interviewer Use

Date complaint received

Public health region received by

Public health agency received by

Staff member received by

Information for Complainant

The Tennessee Department of Health uses information from foodborne illness complaints to better identify and investigate illness and food establishments. We would like to learn about:

- suspected establishments
- illness symptoms
- ill persons
- other establishments and exposures before your illness

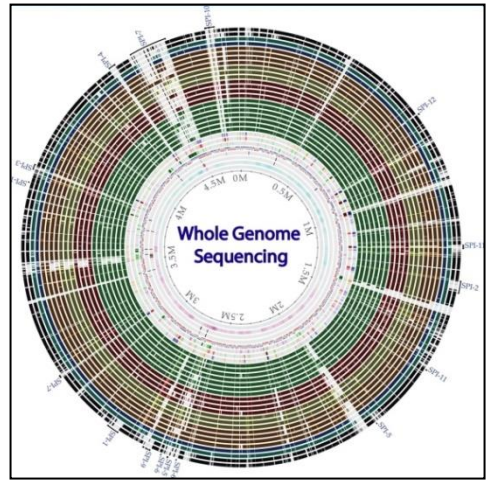
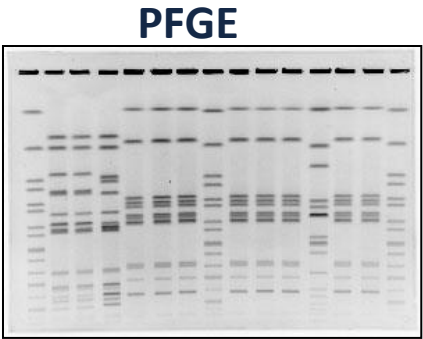
This information will be used for public health purposes only and will be kept confidential to the extent allowed by law.

The information you provide could help to prevent future foodborne illnesses from occurring.

Thank you!

Contact Information

Norovirus Outbreaks



Tools for Developing Hypothesis– Signs and Symptoms

Foodborne Outbreaks

[CDC](#) > [Food Safety](#) > [Foodborne Outbreaks](#) > [Investigating Outbreaks](#)



↑ Foodborne Outbreaks

Multistate Outbreaks +

Investigating Outbreaks -

Steps in a Foodborne Outbreak Investigation +

How to Report Foodborne Illness +

Public Communication

SEDRIC

Interpretation of Epidemic Curves

Identifying Commercial Entities

Size & Extent of Foodborne Outbreaks

Key Players

Partnerships

Confirming Diagnosis

Guidelines for Specimen Collection

Guide to Confirming an Etiology in Foodborne Disease Outbreak

A foodborne disease outbreak is defined as an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food.* Foodborne disease outbreaks should be reported to CDC's Enteric Diseases Epidemiology Branch through the [National Outbreak Reporting System \(NORS\)](#).**

The following tables provide information about etiologic agents (causes), incubation periods, clinical syndromes, and criteria for confirmation of a case after a foodborne disease outbreak has been identified. The information on incubation periods and clinical syndromes is not part of confirmation criteria. These guidelines might not include all etiologic agents and diagnostic tests.

Report a Foodborne Disease Outbreak



[Get started >](#)

Guidelines for Confirming Cause of Foodborne Disease Outbreaks

Bacterial Chemical Parasitic Viral

Etiologic Agent	Incubation Period	Clinical Syndrome	Confirmation
<i>Bacillus cereus</i> – Vomiting toxin	1-6 hrs	Vomiting; some patients with diarrhea; fever uncommon	Isolation of organism from stool of two or more ill persons and not from stool of control patients

Pathogen Hypothesis – Salmonella

Guidelines for Confirming Cause of Foodborne Disease Outbreaks

Bacterial

Chemical

Parasitic

Viral

Etiologic Agent	Incubation Period	Clinical Syndrome	Confirmation
Nontyphoidal <i>Salmonella</i>	6 hrs-10 days; usually 6-48 hrs	Diarrhea, often with fever and abdominal cramps	Isolation of organism of same serotype from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food
<i>Salmonella Typhi</i>	3-60 days; usually 7-14 days	Fever, anorexia, malaise, headache, and myalgia; sometimes diarrhea or constipation	Isolation of organism from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food

Pathogen Hypothesis – Norovirus

Guidelines for Confirming Cause of Foodborne Disease Outbreaks

Bacterial

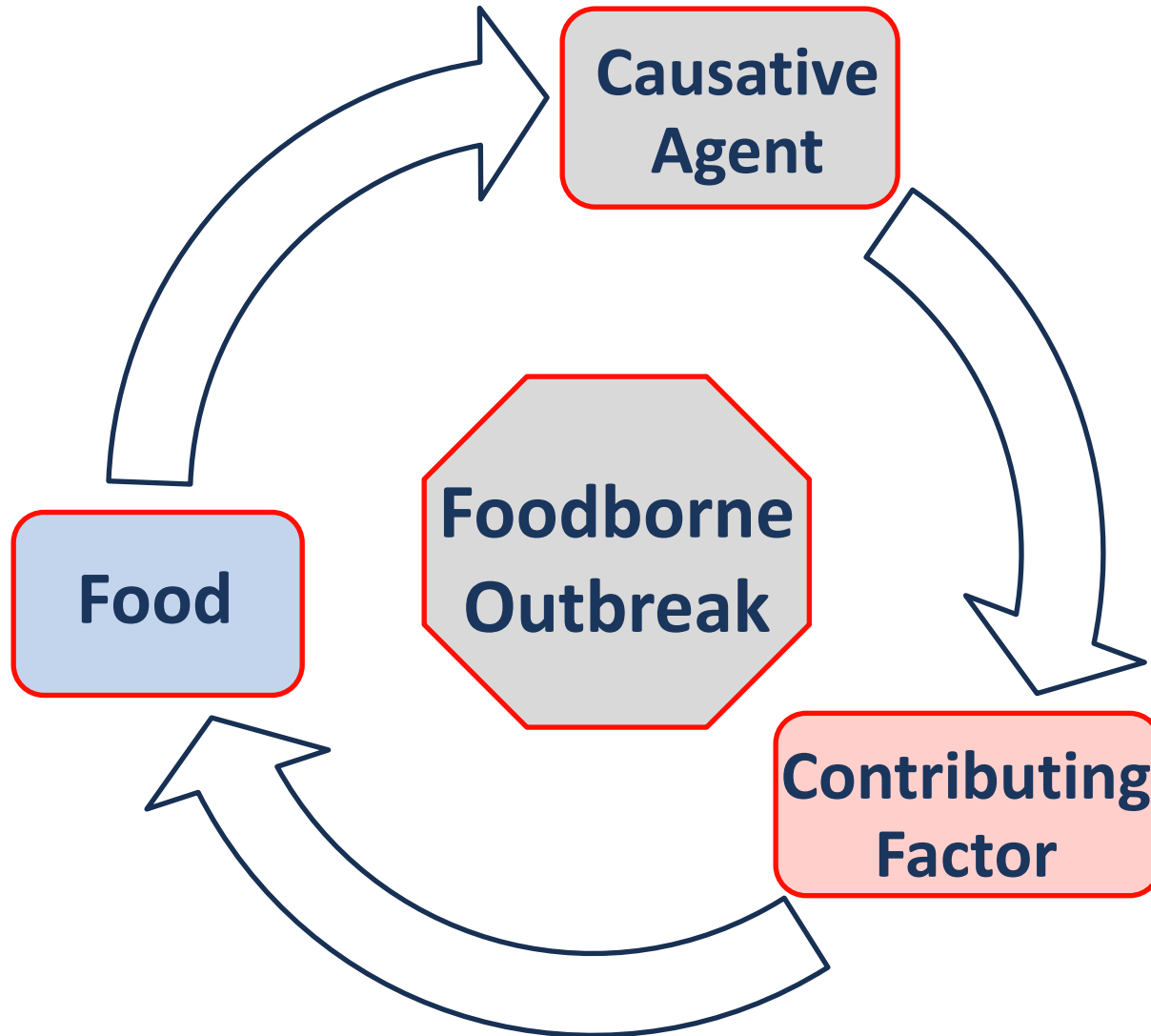
Chemical

Parasitic

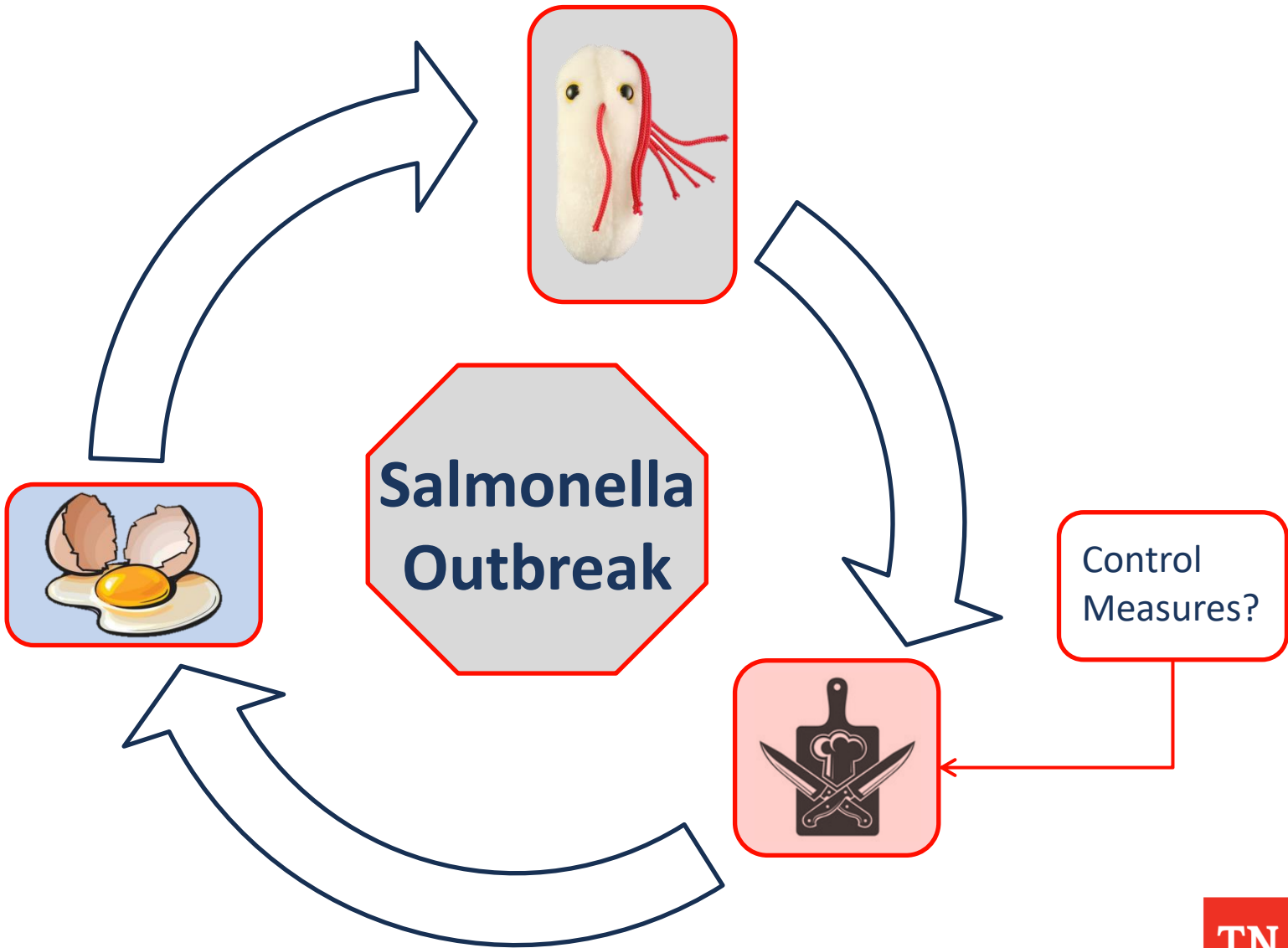
Viral

Etiologic Agent	Incubation Period	Clinical Syndrome	Confirmation
Hepatitis A	15-50 days; median: 28 days	Jaundice, dark urine, fatigue, anorexia, nausea	Detection of immunoglobulin M antibody to hepatitis A virus (IgM anti-HAV) in serum from two or more persons who consumed epidemiologically implicated food
Norovirus (NoV)	12-48 hrs (median 33 hours)	Diarrhea, vomiting, nausea, abdominal cramps, low-grade fever	Detection of viral RNA in at least two bulk stool or vomitus specimens by real-time or conventional reverse transcriptase-polymerase chain reaction (RT-PCR) OR

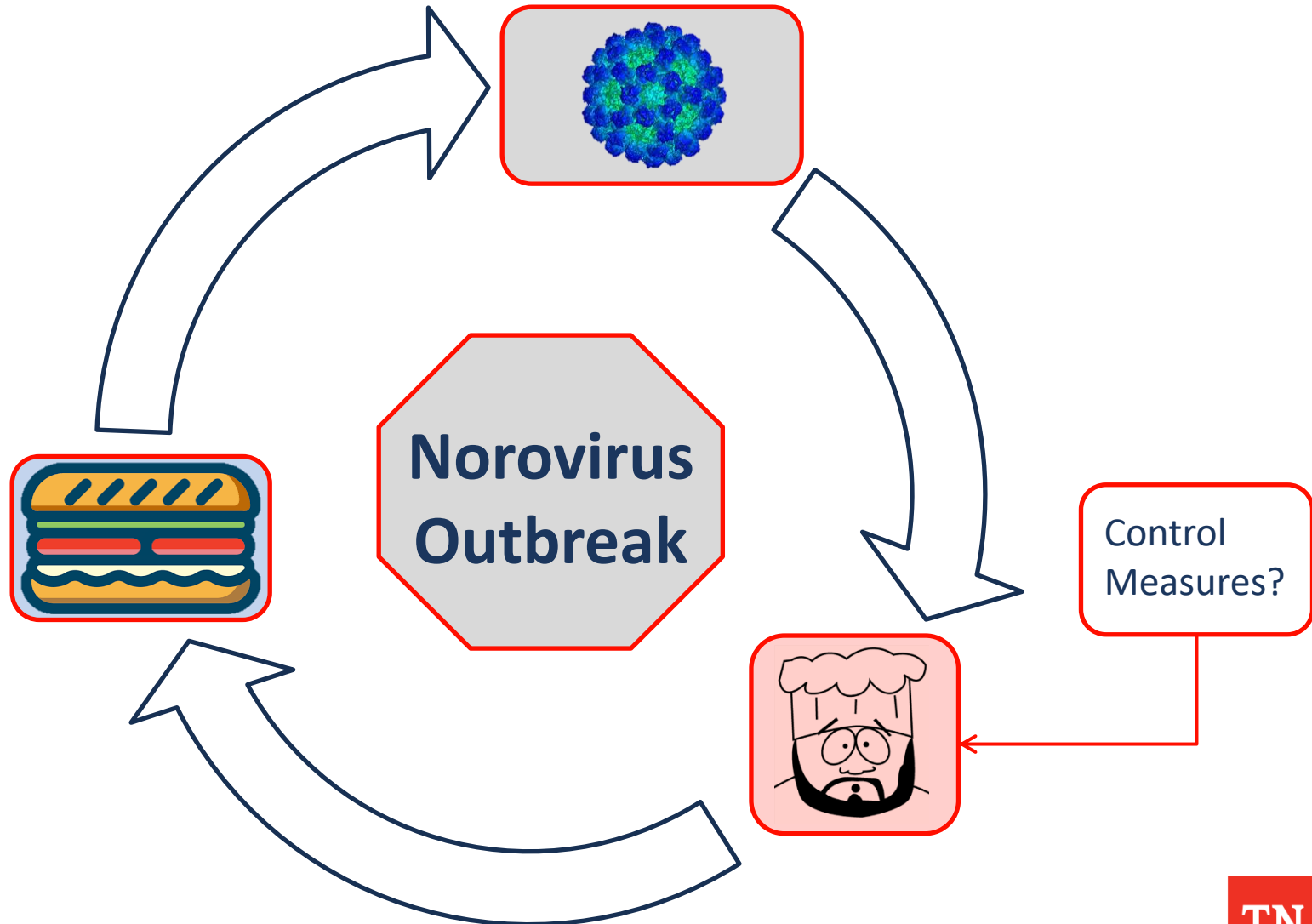
Common Relationships



Common Relationships - Salmonella



Common Relationships - Norovirus



Contributing Factor Hypothesis Generation - Resources

International Association
for Food Protection

Procedures to Investigate Foodborne Illness

Sixth Edition

Contributing Factor Hypothesis Generation – Resources Example

Key D Situations that likely contributed to outbreaks of foodborne diseases when vegetables were implicated as vehicles

	Vegetables	Farm/Field										Processing										Retail Store/Food Service/Home																			
		Contamination Issues										Contamination Issues										Holding/Storage			Processing							Contamination			Holding/Storage				Processing		
		Colonized/Infected/Toxicogenic Animals	Environment/Climate	Animal Feces/Manure	Sewage	Soil/Grass/Mud	Water	Worker	Prolonged Storage	Cross Contamination	During Cooling	Environment	Improper Cleaning of Equipment	Manipulation/Spread	Use of Contaminated Water	Worker	Improper Hot Holding	Inadequate Refrigeration	Prolonged storage	Room/Outdoor Temperature Holding	Heat Process Failure	Improper Cooling	Improper pH Adjustment	Improper Water Activity (a _w)	Inadequate Reheating	Organism/Toxin Survives Process	Improper/Defective Packaging	Cross Contamination	Improper Cleaning of Equipment	Worker/Person	Improper Hot Holding	Inadequate Refrigeration	Prolonged storage	Room/Outdoor Temperature Holding	Heat Process Failure	Improper Cooling	Inadequate Reheating	Organism/Toxin Survives Process			
HERBS/ GREEN ONIONS/PEPPERS (hot and mild)																																									
Raw / Dried	Bacteria																																								
	<i>Escherichia coli</i> O157:H7	×	✓	×	▲	×		✓		✓	✓		▲			✓											✓	✓			✓		▲								
	<i>Salmonella</i>	×	×	✓	▲	×		✓	✓	✓																	✓	✓		✓	✓	✓									
	<i>Shigella</i>			✓	✓	×							✓													▲		✓	✓		▲										
	Parasite																																								
	<i>Cyclospora cayetanensis</i>			×	×	×																																			
	Virus																																								
	Hepatitis A Virus			✓	×	×								×														×													
LEAFY GREENS																																									
Raw	Bacteria																																								
	<i>Escherichia coli</i> STEC/STEC	×	×	×	✓	×		✓		✓	▲		▲			✓											✓	▲		✓											
	<i>Listeria monocytogenes</i>	×	×	×	×		×						▲				×										▲	▲		✓	✓										
	<i>Salmonella</i>	×	×	×	▲	✓		✓	✓	▲			▲														▲	▲			▲										
	<i>Shigella</i>			×	✓	×							▲	×															×	▲		▲									
	Parasite																																								
	Various (such as <i>Cryptosporidium</i> and <i>Giardia</i>)	×		×	▲	✓		✓		✓		✓	✓													✓	✓	✓													
	Virus																																								
	Hepatitis A Virus			×	✓	×							▲	×																											
	Norovirus			×	✓	×			✓				▲	×														×													

Contributing Factor Hypothesis Generation – Salmonella

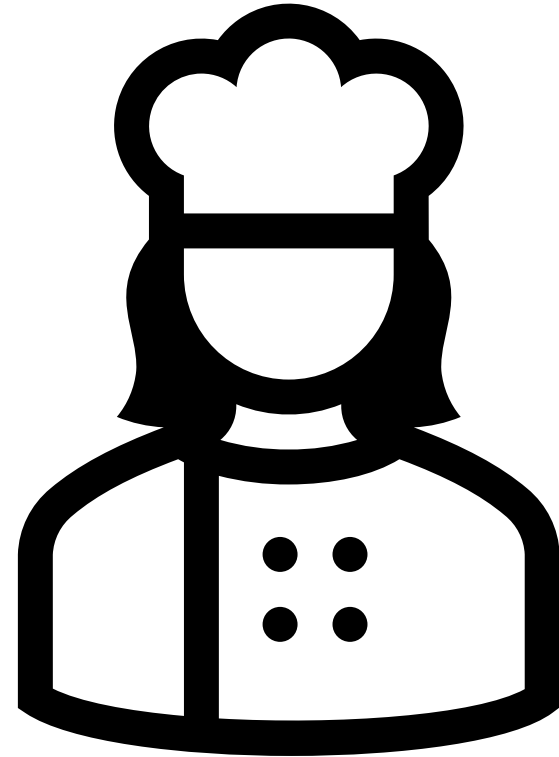
Vegetables		Retail Store/Food Service/Home										
		Contamination		Holding/Storage				Processing				
		Cross Contamination	Improper Cleaning of Equipment	Worker/Person	Improper Hot Holding	Inadequate Refrigeration	Prolonged storage	Room/Outdoor Temperature Holding	Heat Process Failure	Improper Cooling	Inadequate Reheating	Organism/Toxin Survives Process
<p>✗ = Principal Factor to Consider ✓ = Factor to Consider ▲ = Potential Factor to Consider ● = Source of Contamination, but likely to be destroyed during later processing T = Toxin Survives Heat Processes</p>												
HERBS/ GREEN ONIONS/PEPPERS												
Raw / Dried	Bacteria											
	<i>Escherichia coli</i> O157:H7	✓	✓			✓		▲				
	<i>Salmonella</i>	✓	✓			✓	✓	✓				
	<i>Shigella</i>	▲		✓		✓		▲				
	Parasite											
	<i>Cyclospora cayetanensis</i>			✗								
	Virus											
	Hepatitis A Virus			✗								
LEAFY GREENS												
Raw	Bacteria											
	<i>Escherichia coli</i> STEC/VTEC	✓	▲			✓						
	<i>Listeria monocytogenes</i>	▲				✓	✓					
	<i>Salmonella</i>	▲	▲			✓		▲				
	<i>Shigella</i>			✗		▲		▲				
	Parasite											
	Various (such as <i>Cryptosporidium</i> and <i>Giardia</i>)	✓	✓	✓								
	Virus											
	Hepatitis A Virus			✗								
Norovirus			✗									

Contributing Factor Hypothesis Generation – Norovirus

Vegetables		Retail Store/Food Service/Home										
		Contamination		Holding/Storage				Processing				
		Cross Contamination	Improper Cleaning of Equipment	Worker/Person	Improper Hot Holding	Inadequate Refrigeration	Prolonged storage	Room/Outdoor Temperature Holding	Heat Process Failure	Improper Cooling	Inadequate Reheating	Organism/Toxin Survives Process
<p>✗ = Principal Factor to Consider ✓ = Factor to Consider ▲ = Potential Factor to Consider ● = Source of Contamination, but likely to be destroyed during later processing T = Toxin Survives Heat Processes</p>												
HERBS/ GREEN ONIONS/PEPPERS												
Raw / Dried	Bacteria											
	<i>Escherichia coli</i> O157:H7	✓	✓			✓		▲				
	<i>Salmonella</i>	✓	✓			✓	✓	✓				
	<i>Shigella</i>	▲		✓		✓		▲				
	Parasite											
	<i>Cyclospora cayetanensis</i>			✗								
	Virus											
	Hepatitis A Virus			✗								
LEAFY GREENS												
Raw	Bacteria											
	<i>Escherichia coli</i> STEC/VTEC	✓	▲			✓						
	<i>Listeria monocytogenes</i>	▲				✓	✓					
	<i>Salmonella</i>	▲	▲			✓		▲				
	<i>Shigella</i>			✗		▲		▲				
	Parasite											
	Various (such as <i>Cryptosporidium</i> and <i>Giardia</i>)	✓	✓	✓								
Virus												
	Hepatitis A Virus			✗								
	Norovirus			✗								

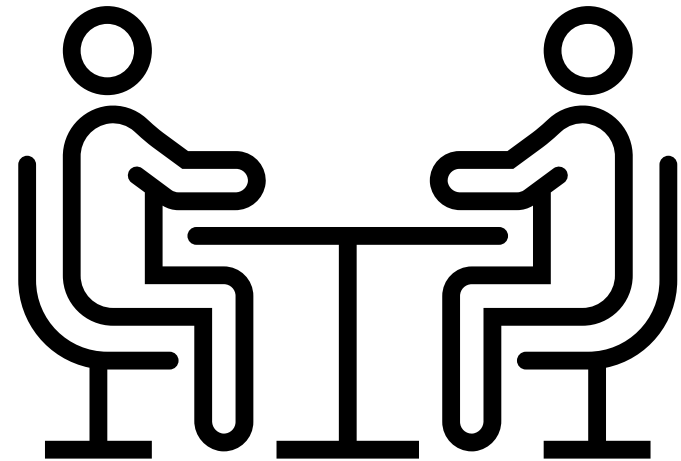
Questions for the staff: Employee/Family Health

- Have you or any of your staff reported being ill?
 - Do you have an employee illness policy?
 - Do you maintain sick/call out logs?
 - Do you have employee work calendar from the past month?
 - If ill employees, can they provide stool?
- Have any of your family members been ill with v/d?



Questions for the staff: V/D Events and Sewage

- Was there a vomiting or diarrheal event in the facility?
 - If yes:
 - Who cleaned?
 - Where did it happen?
 - How was it cleaned (what disinfectants were used)?
 - Do you have v/d clean-up kit?
 - Environmental sampling
- Have you had any sewage issues in the facility?
 - Floor drains backing up?
 - Toilets overflowing?



Facility Observation: No bare-hand contact/hand washing culture and hand washing facilities

- Do you practice no bare-hand contact with RTE's?
 - Is this observed during the assessment?
- Is proper hand washing observed?
- Are the hand washing facilities accessible and properly maintained?



Food Source Norovirus Outbreak Questions

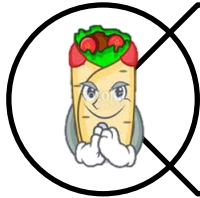
- Where do you source shellfish and berries?
 - Have there been recent changes in supplier?
 - Have noticed a change in the product from your supplier?
 - Who is your supplier?
 - Do you keep invoices and receipts of purchases?



Outbreak Investigation Example



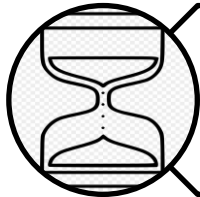
Complaint Received 1/28/19



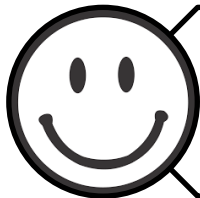
Meal Date 1/26/19



Reported 5 out of 20 ill in party



~30-40 hour incubation beginning with diarrhea followed with nausea and vomiting



Symptoms resolving in 1-2 days

Environmental Assessment



Site visit conducted on 1/30/19



Ill food handlers identified



Verbal illness policy



Improper glove use



No disinfection policy



NEARS data collected



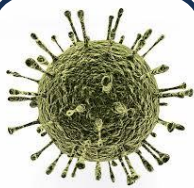
Immediate control measures put into place

Restaurant Follow-Up

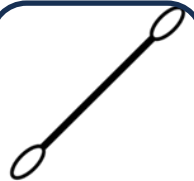
On 2/5 second site visit conducted



Disinfection measures reemphasized



Norovirus education documents shared



17 swabs collected



3 stool kits provided to food handlers who reported ill

Clinical Lab Results

TN19-008 Line List

First Name	Onset	Stool Kit Provided	Specimen submitted to lab	Lab Submission Date	Lab Result	REDCap Complaint ID	Table
Case 1	1/27/2019	Y	Y	2/1/2019	G2 positive	425	A
Case 2	1/27/2019	Y	Y	1/30/2019	G2 positive	428	A
Case 3	1/27/2019	Y	Y	2/1/2019	G2 positive	427	A
Case 4		N	N/A			429	A
Case 5	1/27/2019	Y	Y	2/1/2019	G2 positive	N/A	B
Case 6	1/27/2019	Y	Y	2/1/2019	G2 positive	N/A	B
Case 7		N				N/A	B
Case 8		N				N/A	B
Employee 1	1/22/2019	Y	Y	2/6/2019	G2 positive		N/A
Employee 2	1/20/2019	Y	Y	2/6/2019	G2 positive		N/A
Employee 3	1/25/2019	Y	Y	2/6/2019	negative		N/A
Cold/flu symptoms no V/D 3 hour incubation from suspected meal							
Employees							

Over two weeks past illness onset!!!

Environmental Swab Lab Results

Swab #	Collection Location	Results
1	Men's restroom base of toilet and around floor	—
2	Men's restroom base fo toilet and around floor	—
3	Men's restroom Toilet rim and around where seat connects to toilet	—
4	Men's restroom. Underneath toilet seat	+
5	Men's restroom. Baseboard and side of wall next to toilet	—
6	Women's restroom: base of toilet and around floor	—
7	Women's restroom: toilet rim and where seat connects to toilet	—
8	women's restroom: Underneath toilet seat	+
9	women's restroom: baseboard and side of wall next to toilet	—
10	kitchen knobs on stove	—
11	kitchen outside door handle on WIC	—
12	WIC door on inside where door is pushed open	—
13	Handle of lid for ice machine	—
14	service line: RIC door handle behind cash register	—
15	service line: RIC door handle by grill	—
16	service line: Temp control knobs on steam table	—
17	service line: credit card machine and cash register buttons	—

Control Measures, Control Measures, Control Measures



Exclusion



No Bare-hand Contact



Disinfection



Handwashing



Maintenance

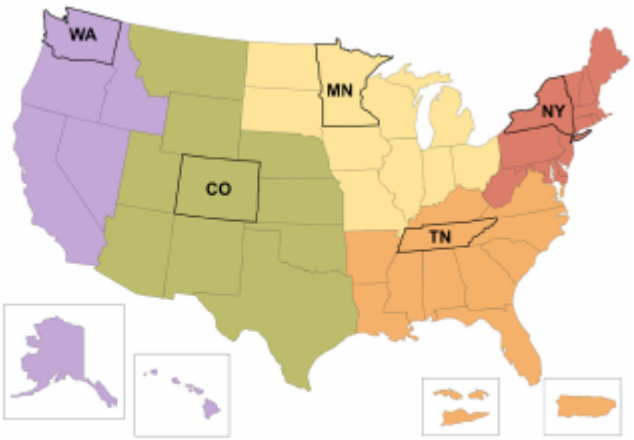


Food Source

Resources

Accessible version: <https://www.cdc.gov/foodsafety/centers/factsheet.html>

Integrated Food Safety Centers of Excellence (CoEs) Supporting and enhancing enteric surveillance and outbreak investigation



CS-311112 October 2019

Reach Out

Email: FoodSafetyCoE@cdc.gov
Follow us: @FoodSafetyCoE
Find our products:
www.CoEFoodSafetyTools.org

For more information, visit www.cdc.gov/foodsafety/centers.



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention



Environmental Sampling
A Tool for Solving Outbreaks at
The Retail Food Level

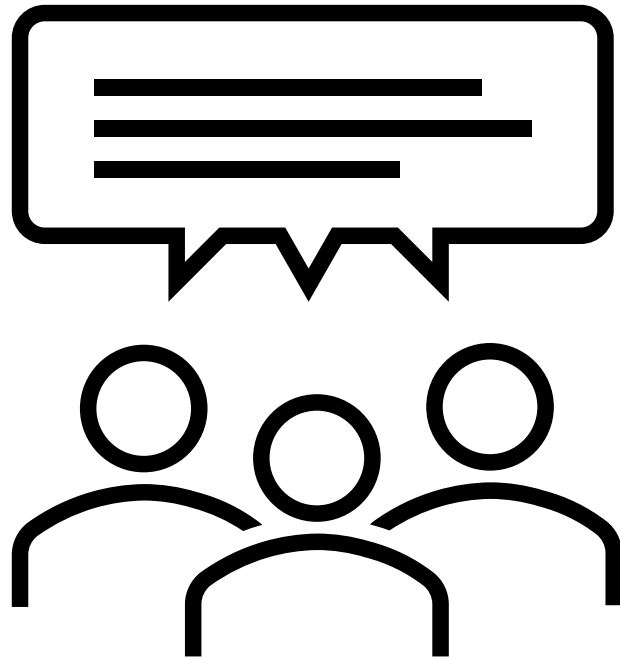


Special Thanks

- EHS-Net Food (CDC)
- TN Dept of Health
- Centers of Excellence
- Danny Ripley (THD)
- Dr. John Dunn (TDH)
- Katie Garman (TDH)
- Steffany Cavallo (TDH)
- Mid-Cumberland Regional HD



Questions?



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