



Investigating Norovirus Outbreaks at Retail Food Service Establishments

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2019 AFDO Webinar
11/8/2019

CDC's EHS-Net



EHS

Environmental Health Specialists Network (EHS-Net)

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EHS-Net Resources



Publications



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Environmental Health Specialists Network (EHS-Net)

More than half of all foodborne illness outbreaks in the United States are associated with restaurants. Learn about EHS-Net and how it helps state and local health departments improve the practice of environmental health service programs who work to prevent outbreaks.



Program Activities



About EHS-Net

Learn how we help health departments improve the practice of EH food service programs



EHS-Net Partners

Learn about our local, state, and federal partners



Food Safety Projects

Get information about our projects



Findings in Plain Language

Read our scientific articles and study findings and recommendations in plain language



EHS-Net Publications

Read EHS-Net publications grouped by study topic



EHS-Net Resources

Find resources including tools from partners, tools for food safety projects, NEARS, and more

<https://www.cdc.gov/nceh/ehs/ehsnet/index.htm>

TN

Importance of Environmental Health

cdc.gov/cdctv/environmentalhealth/environmental-health-services-important.html



[A-Z Index](#)

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📧 Get Email Updates

Why Are Environmental Health Services So Important?



🔗 [Low Resolution Video](#)

Why Are Environmental Health Services So Important?

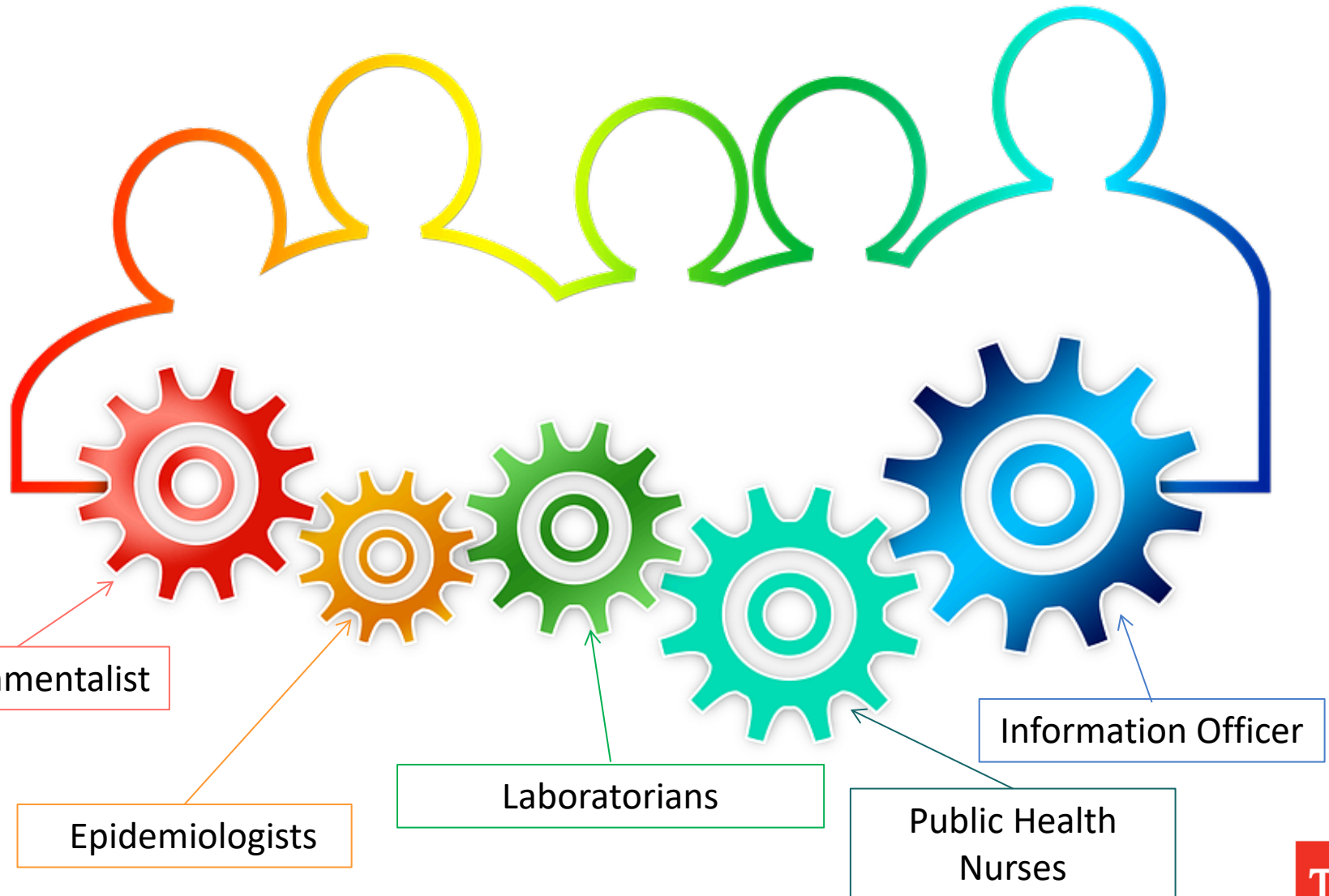
<https://www.cdc.gov/cdctv/environmentalhealth/environmental-health-services-important.html>



Tennessee Department of Health: Nashville, TN



Who's on the outbreak team?

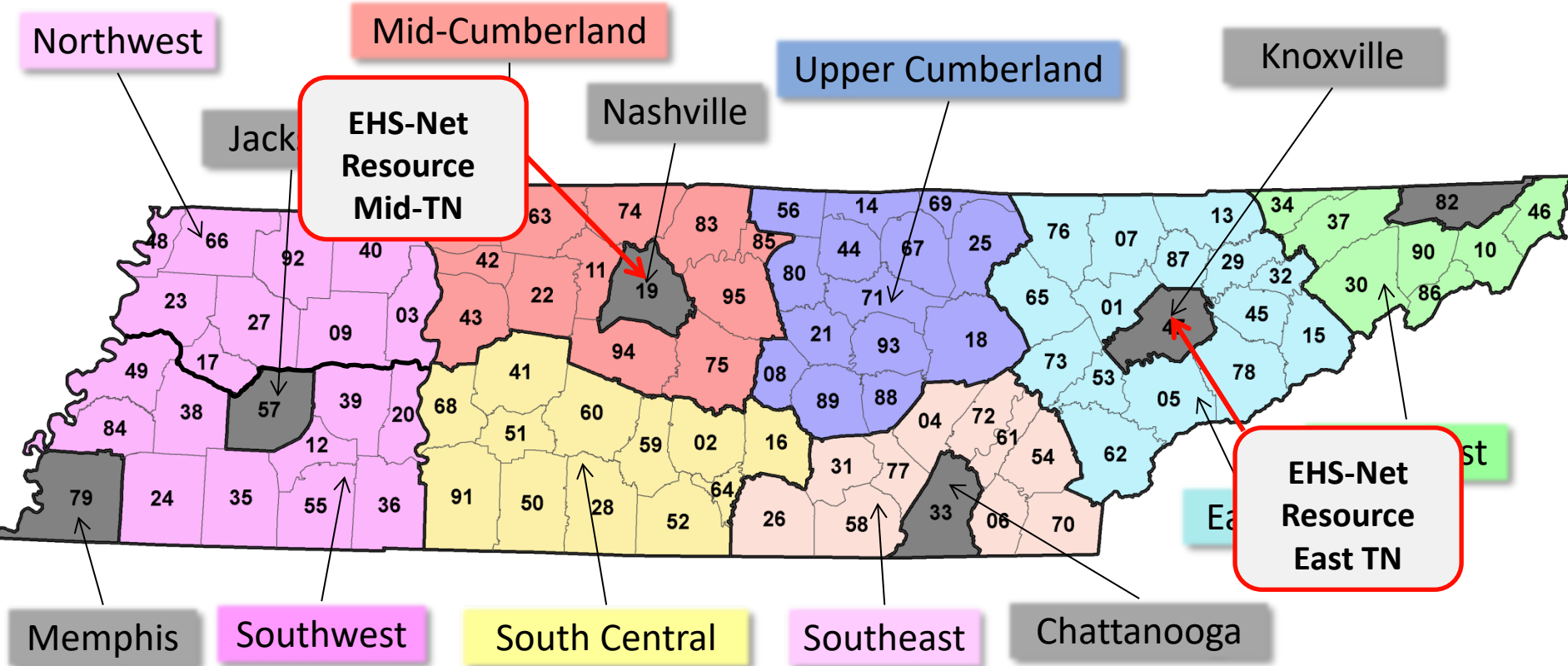


Who will investigate?

- 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	6.5 Million	28,000	170

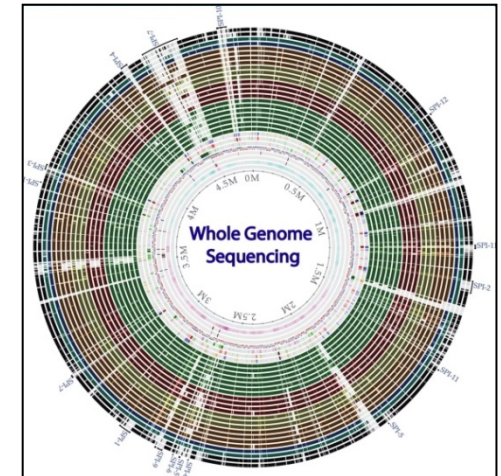
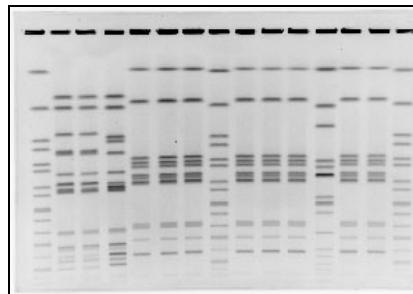
How are you notified?

- 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

The screenshot shows a web-based form titled "Foodborne Illness Complaint" with a "Save & Exit Form" button. Below the title, there are links for "Download PDF of Instrument(s)" and "Share Instrument in the Library". The form includes a "REDCap ID" field with the value "209". The main section is titled "Foodborne Illness Complaint Form" and contains instructions for interviewers. It has sections for "For Interviewer Use" (with fields for date, public health region, public health agency, and staff member) and "Information for Complainant" (with a list of questions about suspected establishments, illness symptoms, and other exposures). A "Contact Information" section is at the bottom.

**Norovirus
Outbreaks**

PFGE



What information do you have? Salmonella



Pathogen?

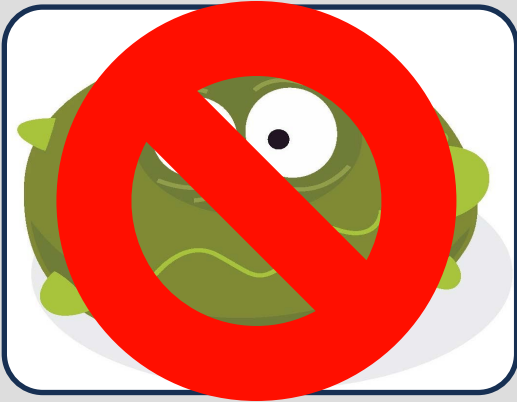


Implicated
Food?



Signs
symptoms?

What information do you have? Norovirus



Pathogen?



Implicated
Food?



Signs
symptoms?

Pathogen Prediction – 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 Prediction – 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</i> Typhi	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 Prediction – 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

Pathogen Prediction – Norovirus


Using Clinical and Epidemiologic Criteria for Suspected Norovirus Outbreaks

When it is not possible to get laboratory confirmation of norovirus, health departments can use clinical and epidemiologic criteria to determine if the outbreak was likely caused by norovirus.

The original criteria proposed by Kaplan et al are:

1. A mean (or median) illness duration of 12 to 60 hours,
2. A mean (or median) incubation period of 24 to 48 hours,
3. More than 50% of people with vomiting, and
4. No bacterial agent found.

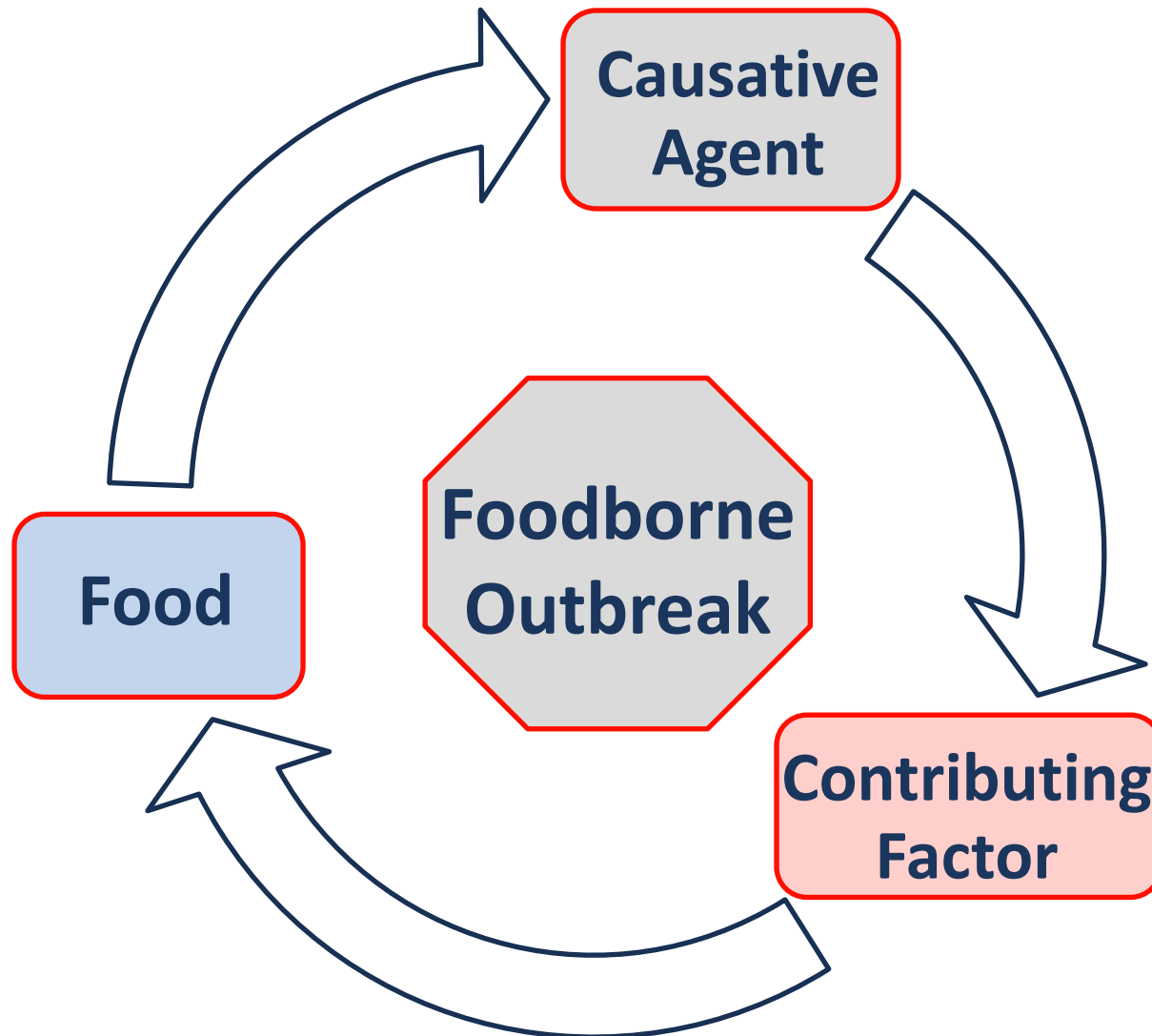
When all four criteria are present, it is very likely that the outbreak was caused by norovirus. However, about 30% of norovirus outbreaks do not meet these criteria. If the criteria are not met, it does not mean that the outbreak was not caused by norovirus.

Recently, an alternate set of clinical criteria proposed by [Lively et al](#)  have been identified that are more sensitive for norovirus and more often available during outbreak investigations than the Kaplan criteria. These are:

1. A greater proportion of cases with vomiting than with fever,
2. Bloody diarrhea in less than 10% of cases, and
3. Vomiting in greater than 25% of cases.

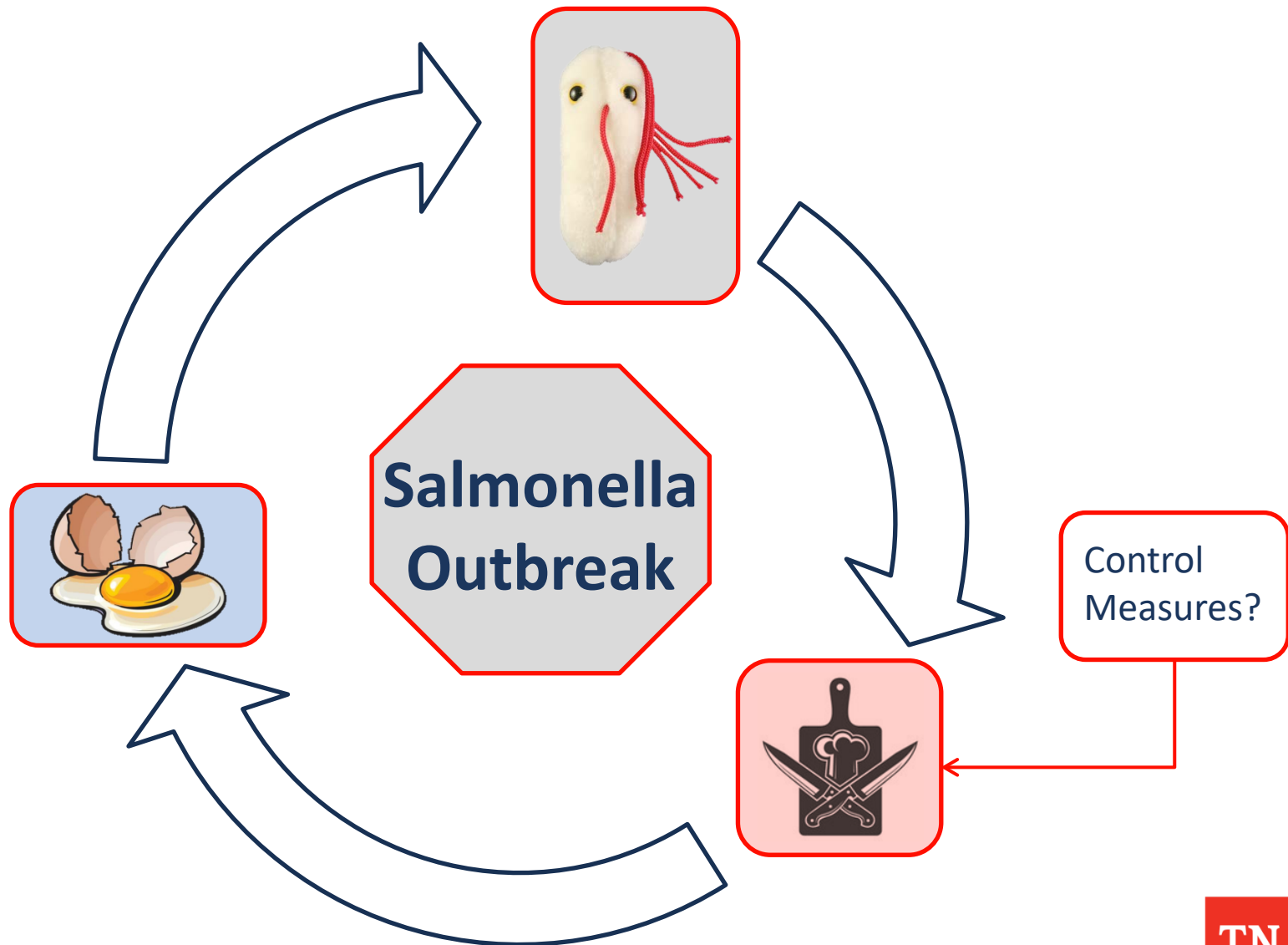


Common Relationships



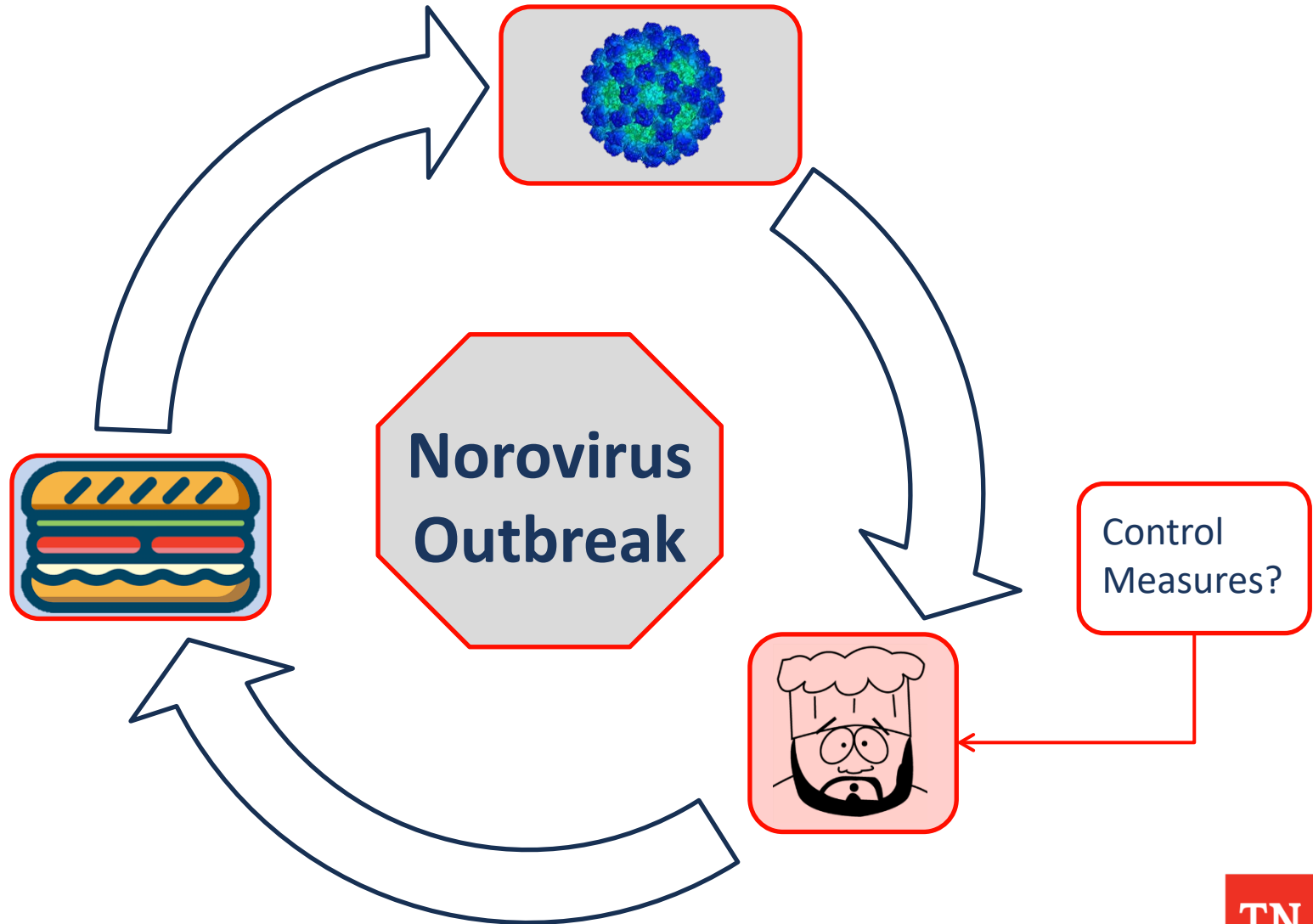


Common Relationships - Salmonella





Common Relationships - Norovirus



Common Relationships - Resources

International Association
for Food Protection



Procedures to Investigate Foodborne Illness

Sixth Edition

Common Relationships – 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		
✕ = 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																																								
HERBS/ GREEN ONIONS/PEPPERS (hot and mild)																																								
Raw / Dried	Bacteria																																							
	Escherichia coli O157:H7	✕	✓	✕		▲	✕			✓		✓	✓		▲			✓										✓	✓			✓		▲						
	Salmonella	✕	✕		✓	✓	▲	✕		✓		✓	✓															✓	✓			✓	✓	✓						
	Shigella					✓		✓	✕						✓	✕		✕										▲		✓		✓	✓	▲						
	Parasite																																							
	Cyclospora cayetanensis					✕		✕	✕								✕														✕									
	Virus																																							
	Hepatitis A Virus					✓		✕	✕							✕															✕									
LEAFY GREENS																																								
Raw	Bacteria																																							
	Escherichia coli STEC/VTEC	✕	✕	✕		✓	✕			✓		✓		▲		▲			✓									✓	▲			✓								
	Listeria monocytogenes	✕		✕		✕			✕				✓						✓	✕								▲	▲				✓	✓						
	Salmonella	✕	✕	✕		▲	✓			✓		✓		▲		▲												▲	▲				✓		▲					
	Shigella					✕		✓	✕							▲	✕														✕		▲		▲					
	Parasite																																							
	Various (such as Cryptosporidium and Giardia)	✕		✕		✕	▲	✓		✓			✓			✓	✓											✓	✓	✓										
Virus																																								
	Hepatitis A Virus					✕		✓	✕						▲	✕															✕									
	Norovirus					✕		✓	✕			✓			▲	✕															✕									

Common Relationships – Resources Example

Vegetables		Retail Store/Food Service/Home																					
		Contamination		Holding/Storage				Processing															
<div>✖ =Principal Factor to Consider</div> <div>✔ =Factor to Consider</div> <div>▲ =Potential Factor to Consider</div> <div>● =Source of Contamination, but likely to be destroyed during later processing</div> <div>T =Toxin Survives Heat Processes</div>		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																							
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			✖																				

Common Relationships – Resources Example

Vegetables		Retail Store/Food Service/Home											
		Contamination		Holding/Storage				Processing					
<div>✗ = Principal Factor to Consider</div> <div>✓ = Factor to Consider</div> <div>▲ = Potential Factor to Consider</div> <div>● = Source of Contamination, but likely to be destroyed during later processing</div> <div>T = Toxin Survives Heat Processes</div>		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											
		Raw / Dried	Bacteria										
			Escherichia coli O157:H7		✓	✓		✓		▲			
			Salmonella		✓	✓		✓	✓	✓			
Shigella			▲		✓	✓		▲					
Parasite													
Cyclospora cayetanensis					✗								
Virus													
Hepatitis A Virus					✗								
LEAFY GREENS													
Raw	Bacteria												
	Escherichia coli STECVTEC		✓	▲		✓							
	Listeria monocytogenes		▲			✓	✓						
	Salmonella		▲	▲		✓		▲					
	Shigella				✗	▲		▲					
	Parasite												
	Various (such as Cryptosporidium and Giardia)		✓	✓	✓								
	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?
- Have any of your family members been ill with v/d?



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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)?
- 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?



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



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

CS-311112 October 2019



Environmental Sampling

A Tool for Solving Outbreaks at The Retail Food Level



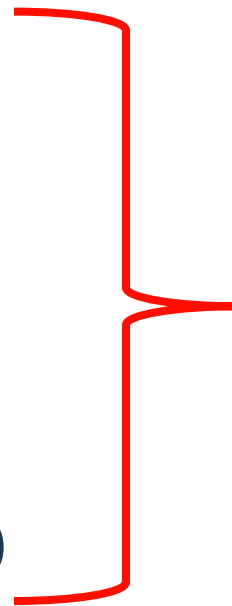
ASSOCIATION OF FOOD & DRUG OFFICIALS
SINCE 1896





Special Thanks

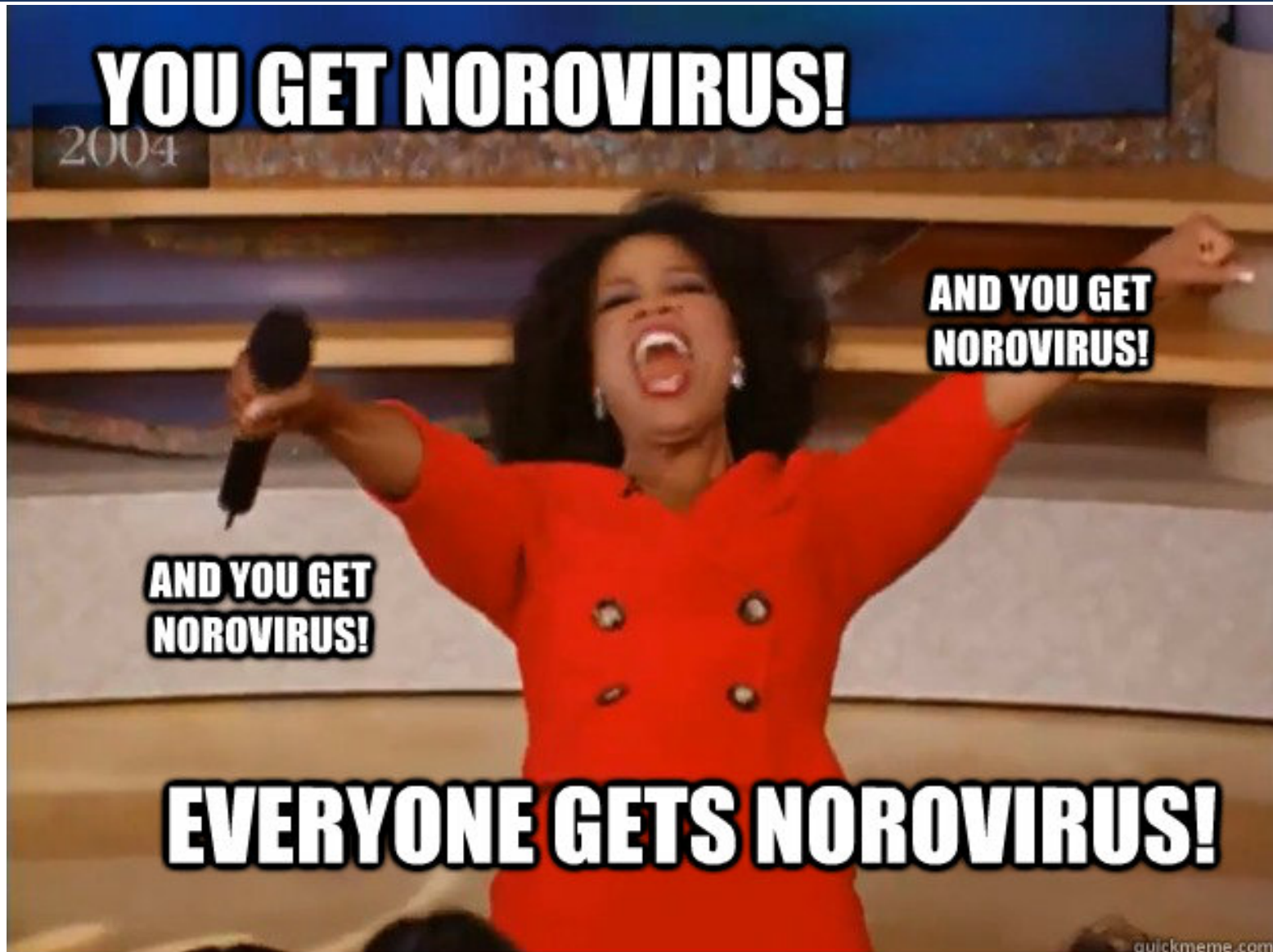
- EHS-Net Food (CDC)
- TN Dept of Health
- Centers of Excellence
- Danny Ripley (THD)
- Dr. John Dunn (TDH)
- Katie Garman (TDH)
- Steffany Cavallo (TDH)



Some good peeps



Questions?



Contact info: DJ Irving, djirving@tn.gov

CDC's EHS-Net Partners

EHS-Net research partners 2015–2020

- California (California Department of Public Health)
- Harris County, Texas (Harris County Public Health and Environmental Services)
- Minnesota (Minnesota State Department of Health)
- New York (New York State Department of Health)
- New York City (Fund for Public Health / New York City Department of Health & Mental Hygiene)
- Rhode Island (Rhode Island Department of Health)
- Southern Nevada (Southern Nevada Health District)
- Tennessee (Tennessee State Department of Health)

