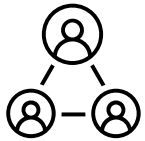
TN Department of Health

# Conducting Environmental Assessments During Foodborne Illness Investigations

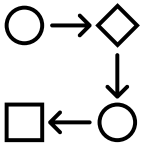
**AFDO Bootcamp**
**and Danny Ripley**
**February 14, 2024**

# Objectives

Discuss foodborne illness impact

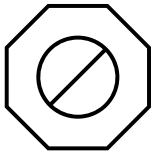


Describe the foodborne investigation team

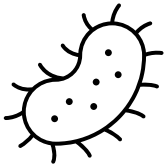


Discuss contributing factors and their antecedents

Describe the methods of an environmental assessment



Summarize traceback investigations and control measures



Provide case-in-point investigation summarizing the methods of an environmental assessment

# Poll Question 1

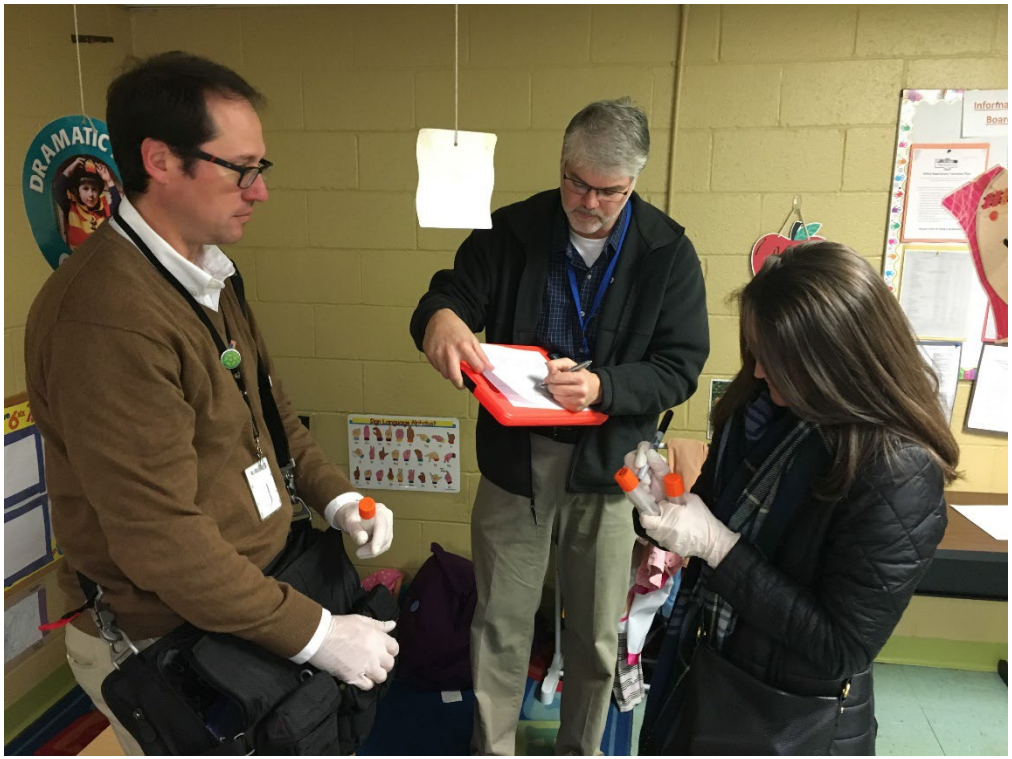
Indicate the number of years you have worked as an environmental health specialist (EHS) and/or in food safety.

A. <1 year
B. 1-5 years
C. 5-10 years
D. >10 years
E. I do not work as an EHS or in food safety

# Poll Question 2

How many foodborne outbreak investigations have you participated in?

A. 0
B. 1-5
C. 6-10
D. >10

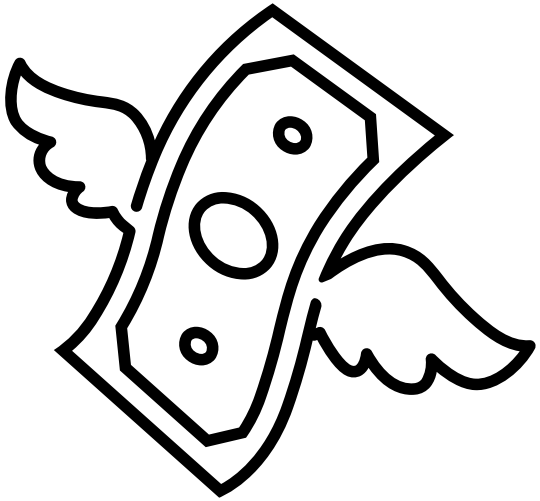


# Foodborne Illness in the United States

- 47.8 million cases per year
- 128,000 hospitalizations
- 3000 deaths

# Cost Associated with Foodborne Illness

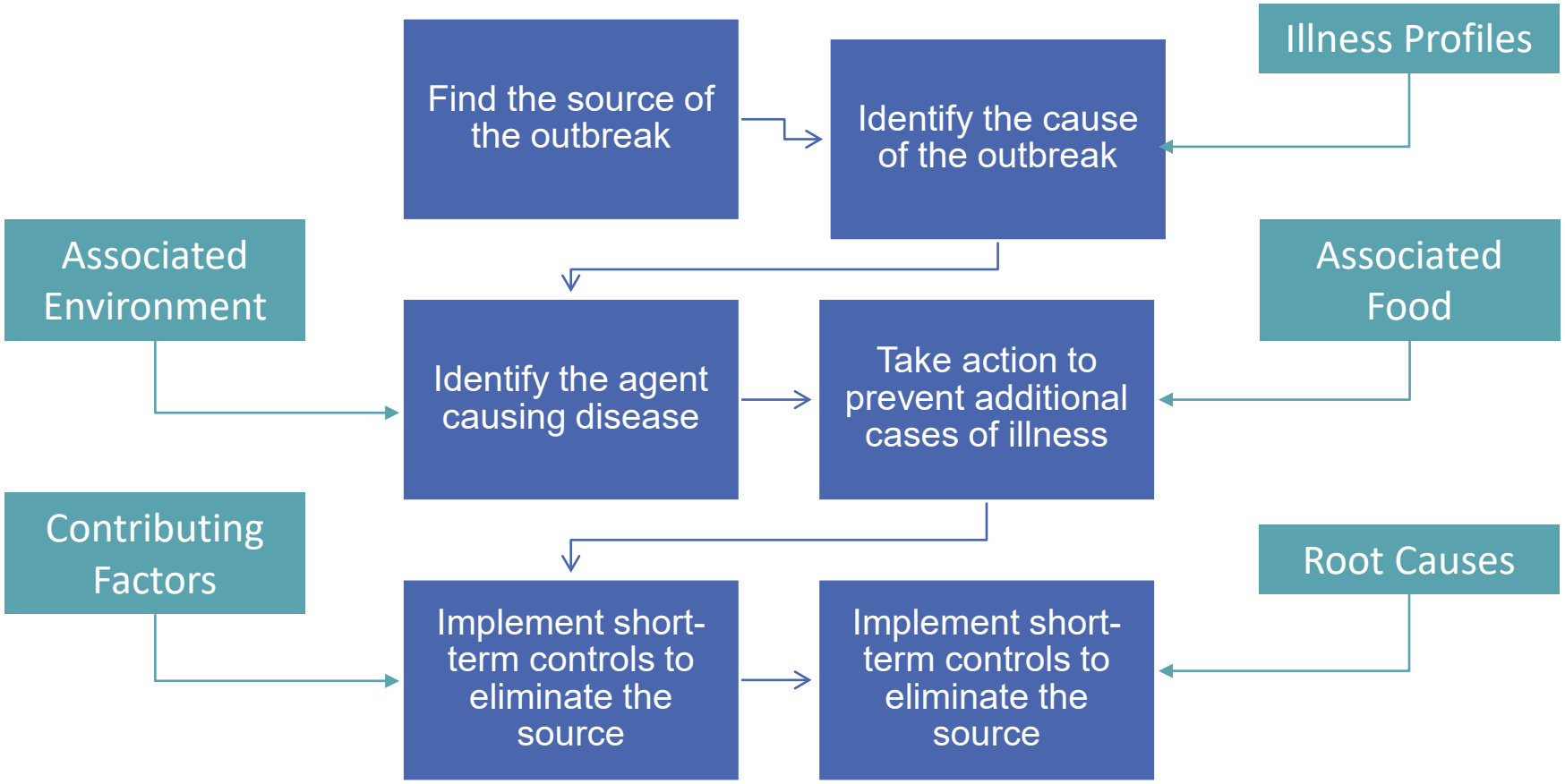
Average annual economic burden associated with the 15 major pathogens identified through outbreak response = **$15.5 billion**



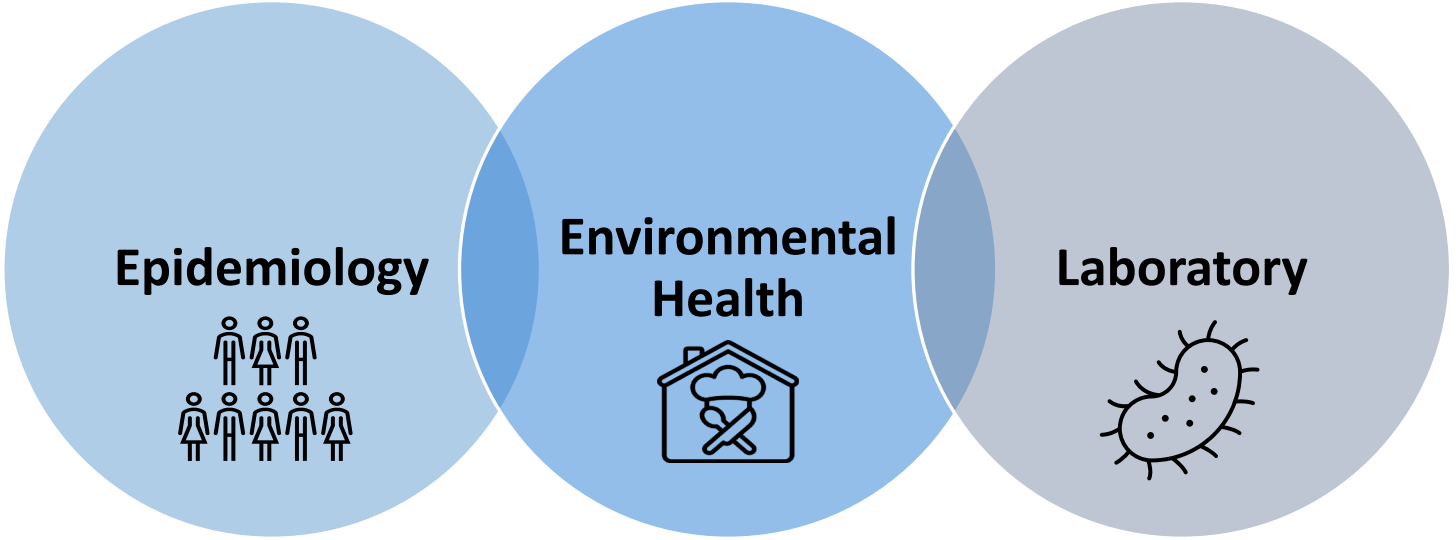
- Acute and chronic illness medical costs
- Costs associated with lost wages
- Costs associated with premature deaths

Source: United States Department of Agriculture - Economic Research Service (2014)

# Goals of the Outbreak Investigation



# Three Core Disciplines of Outbreak Team




- Case-based surveillance
- Interviews
- Hypotheses generation
- Conducts Epi studies
- Data analysis
- Final reporting

- Investigates environments linked to illness
- Collects data and samples
- Interviews workers
- Reviews food systems
- Initiates control measures

- Analyzes clinical, food, and environmental samples
- Interprets test results
- Coordinates testing among laboratories

# Purpose of the Environmental Investigation

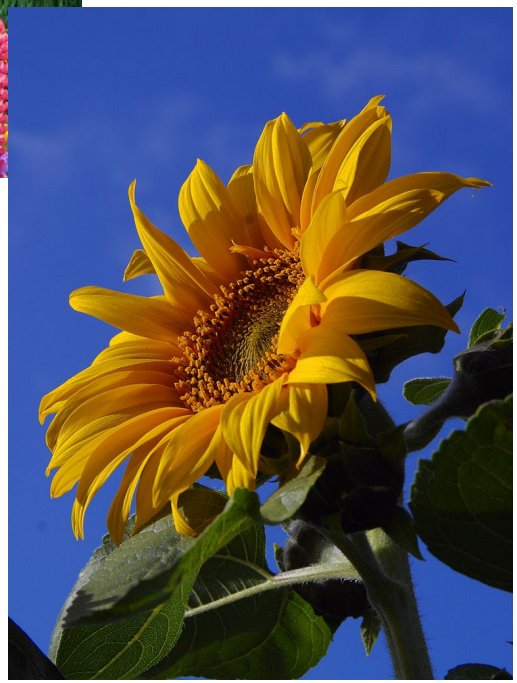
- Determine what went wrong and why
- Initiate control measures
- Communicate findings to the team

# Environmental Health Activities

# Routine Inspection vs Environmental Assessment

Environmental Assessment

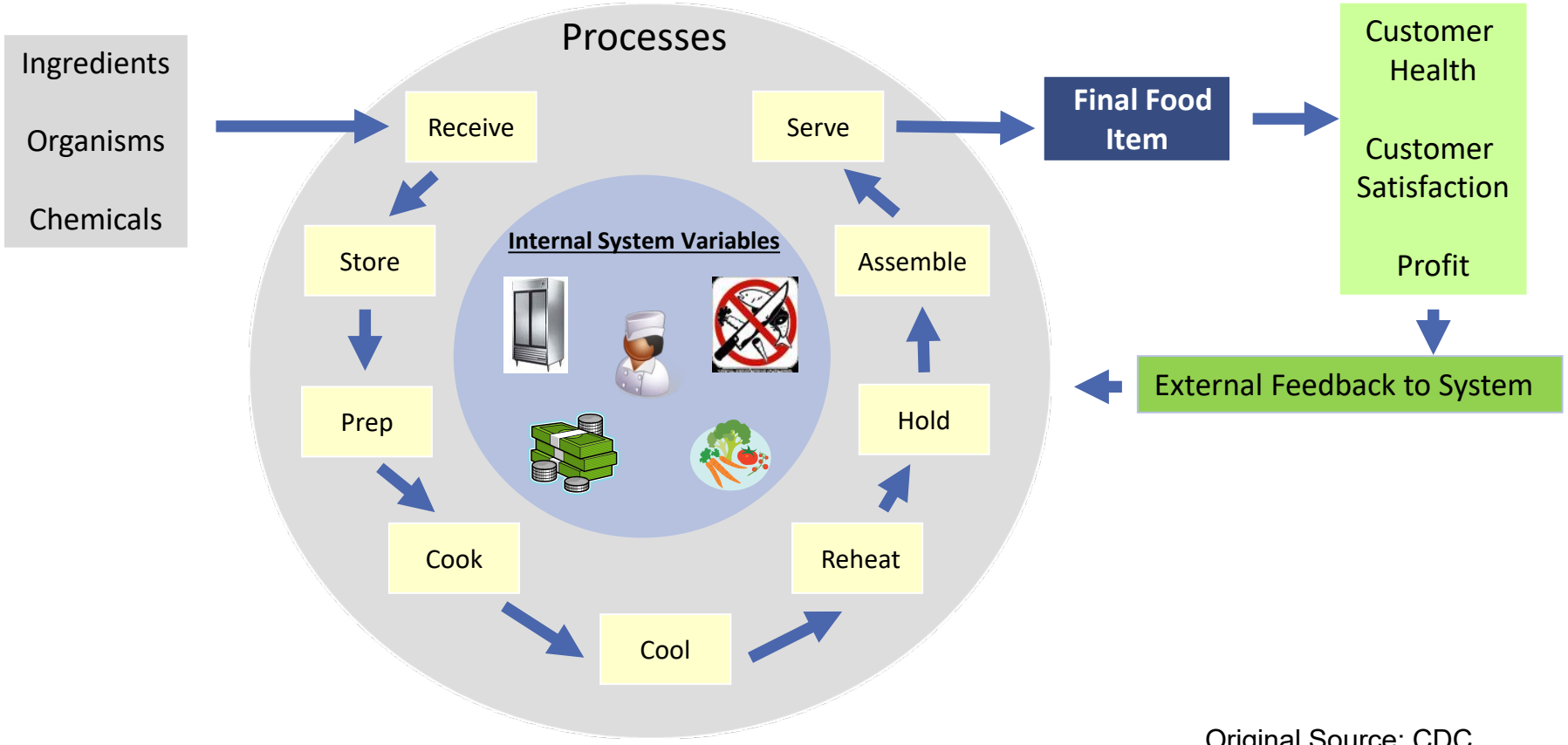
- Focusses on a hypothesis
- Targets specific food, process, people and/or point in time
- Identify system failures



Routine Inspection

- Broad snapshot
- Non-targeted
- Code/regulation based
- Identify violations

# Retail Food Establishment System




Original Source: CDC

# Contributing Factors

**Contributing Factor(s)** – are the most likely conditions that contribute to the contamination, proliferation and/or survival of the etiologic agent or suspected agent. (CDC – NEARS)

| | |
|---|---|
| **CONTAMINATION** | **How pathogens or other hazards are introduced into food** |
| **PROLIFERATION** | **How pathogens increase in food** |
| **SURVIVAL** | **How pathogens survive a kill process** |

**https://www.cdc.gov/nceh/ehs/nears/cf-definitions.htm**

# Contributing Factor Examples

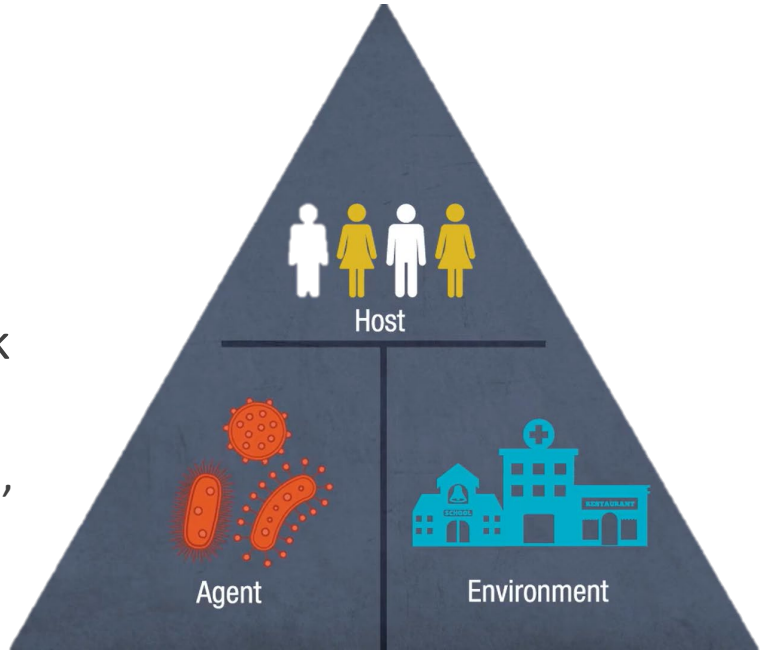
| C1 - C15 | P1 - P12 | S1 – S5 |
|---|---|---|
| **Contamination** | **Proliferation** | **Survival** |
| Natural toxin | Improper refrigeration | Inadequate acidification |
| Poisonous substance | Prolonged cold storage | Improper reheating |
| Infected worker handling food | Improper hot-holding | Improper cooking of raw foods of animal origin |
| Unclean equipment | Inadequate cooling | |
| Raw/ready-to-eat contamination | Inadequate thawing of frozen foods | |
| Bare hand contact of ready-to-eat food | Anaerobic packaging | |
| Contaminated food eaten raw or lightly cooked | Excessive time and temperature abuse during preparation | |

# Determining Contributing Factors

Use available Information
- Environmental assessment
- Epidemiologic studies
- Laboratory findings

Consider applicability and impact on the outbreak
- Must make logical sense
- Must have a relationship with food, practice, person, and/or etiology
- Not always limited to one contributing factor

Understand contributing factor ambiguity
- Subject to interpretation
- Team consensus




Source: CDC

# Determining Contributing Factors

<u>You are investigating a Lab-confirmed *Salmonella* outbreak</u>

- 7 people from 4 households are ill
- Several *different* foods reported
- No clear Epi-link to any one food
- All reported foods were prepared on or stored in prep cooler A


<u>Observational findings</u>:

1. Raw chicken juice on Cooler A prep table
2. Reach-in dairy cooler at 55°F
3. Hand sink out of order in public restroom
4. Rice improperly reheated to 115°F

# Poll Question 3

Given the environmental observations:

1. Raw chicken juice on Cooler A prep table
2. Reach-in dairy cooler at 55°F
3. Hand sink out of order in public restroom
4. Rice improperly reheated to 115°F

Which observation(s) are the most appropriate to report as contributing factor(s) for this outbreak?

A. Observation 1
B. Observations 1 and 2
C. Observations 1, 2, and 4
D. Observations 1-4

# Determining Contributing Factors

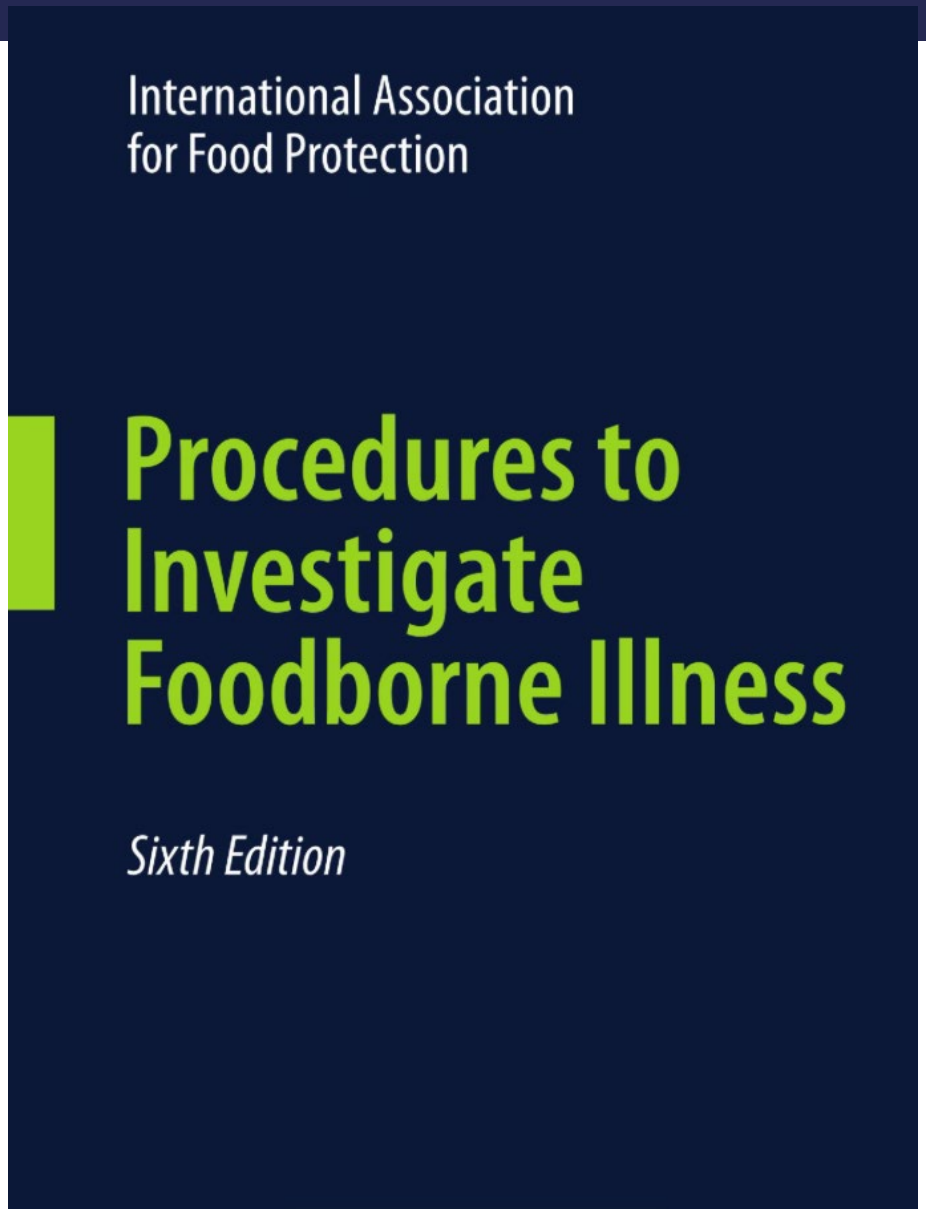
You are investigating a Lab-confirmed *Salmonella* outbreak

- 7 people from 4 households are ill
- Several *different* foods reported
- No clear Epi-link to any one food
- All reported foods were prepared on or stored in prep cooler A


Observational findings:

1. Raw chicken juice on Cooler A prep table
2. Walk-in storage cooler at 48°F
3. Hand sink out of order in public restroom
4. Chili improperly reheated to 115°F

# Contributing Factor Hypothesis Generation - Resources



# Contributing Factor Hypothesis Generation – Resources Example

**Key D** Situtations that likely contributed to outbreaks of foodborne diseases when vegetables wereimplicated as vehicles

**Vegetables**

✕ = 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

| | | Farm/Field | | | | | | | | Processing | | | | | | | Holding/Storage | | | | Processing | | | | | | | | Retail Store/Food Service/Home | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Contamination Issues | | | | | | | | Contamination Issues | | | | | | | | | | | | | | | | | | | Contamination | | | Holding/Storage | | | | Processing | | | |
| | | Colonized/Infected/ Toxigenic 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** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | *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 | | | | ✕ | | ✓ | ✕ | | | | ✓ | | | ▲ | ✕ | | | | | | | | | | | | | | ✕ | | | | | | | |

# Contributing Factor Hypothesis Generation -*Salmonella*

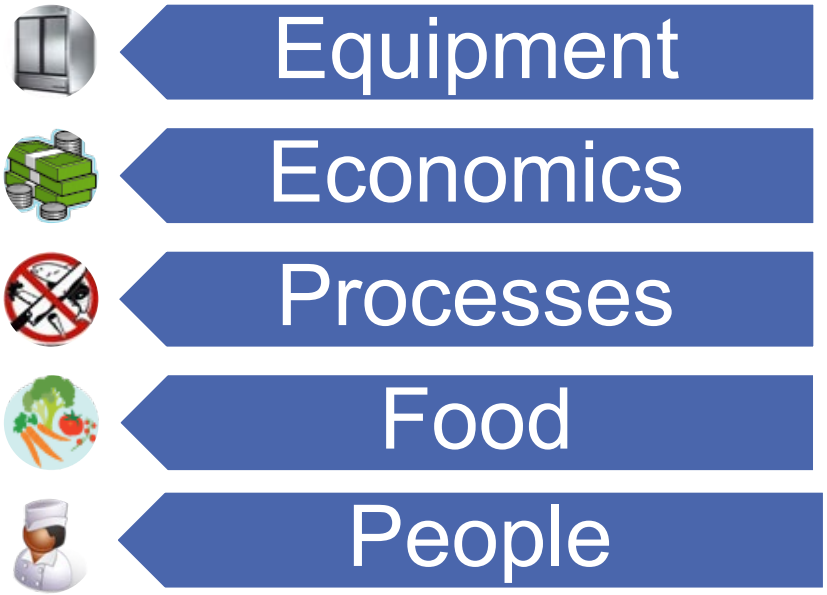
| Vegetables | | Retail Store/Food Service/Home | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Contamination | | | Holding/Storage | | | | Processing | | | |
| ✕ = Principal Factor to Consider<br>✓ = Factor to Consider<br>▲ = Potential Factor to Consider<br>● = Source of Contamination, but likely to be destroyed during later processing<br>T = Toxin Survives Heat Processes | | 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* STEC\VTEC | ✓ | ▲ | | | ✓ | | | | | | |
| | *Listeria monocytogenes* | ▲ | | | | ✓ | ✓ | | | | | |
| | *Salmonella* | ▲ | ▲ | | | ✓ | | ▲ | | | | |
| | *Shigella* | | | ✕ | | ▲ | | ▲ | | | | |
| | **Parasite** | | | | | | | | | | | |
| | Various (such as *Cryptosporidium* and *Giardia*) | ✓ | ✓ | ✓ | | | | | | | | |
| | **Virus** | | | | | | | | | | | |
| | Hepatitis A Virus | | | ✕ | | | | | | | | |
| | Norovirus | | | ✕ | | | | | | | | |

# Contributing Factor Hypothesis Generation – Norovirus

| Vegetables | | Retail Store/Food Service/Home | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Contamination | | | Holding/Storage | | | | Processing | | | | |
| ✕ = Principal Factor to Consider<br>✓ = Factor to Consider<br>▲ = Potential Factor to Consider<br>● = Source of Contamination, but likely to be destroyed during later processing<br>T = Toxin Survives Heat Processes | | 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* STEC\VTEC | ✓ | ▲ | | | ✓ | | | | | | | |
| | *Listeria monocytogenes* | ▲ | | | | ✓ | ✓ | | | | | | |
| | *Salmonella* | ▲ | ▲ | | | ✓ | | ▲ | | | | | |
| | *Shigella* | | | ✕ | | ▲ | | ▲ | | | | | |
| | **Parasite** | | | | | | | | | | | | |
| | Various (such as *Cryptosporidium* and *Giardia*) | ✓ | ✓ | ✓ | | | | | | | | | |
| | **Virus** | | | | | | | | | | | | |
| | Hepatitis A Virus | | | ✕ | | | | | | | | | |
| | Norovirus | | | ✕ | | | | | | | | | |

# Environmental Antecedents

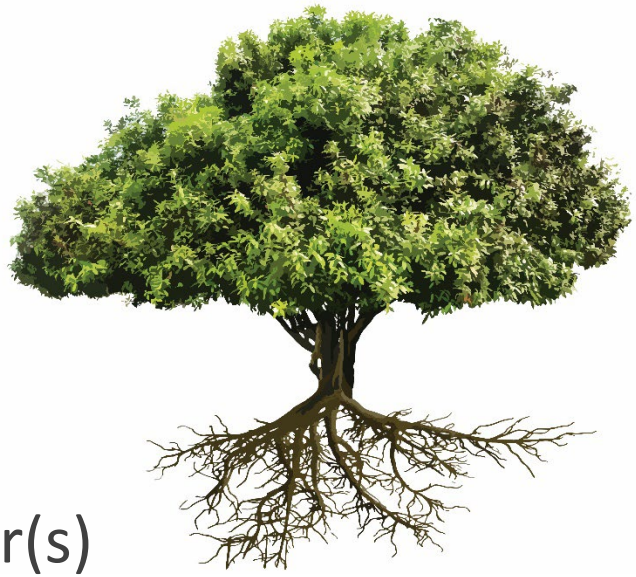
**Environmental Antecedent(s)** – Environmental antecedents are conditions leading to the contamination, survival, or increase of biological or chemical agents in food. (CDC-NEARS)



# Determining Environmental Antecedents

Primarily determined by interview

- Managers
- Food workers



Often multiple potential antecedents

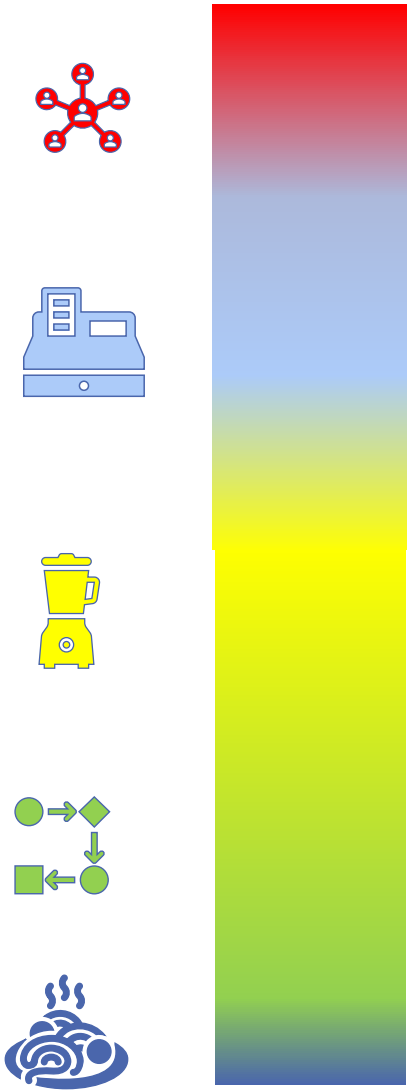
Consider those that best apply

- Should make logical sense
- Should relate to your contributing factor(s)
- Should relate to implemented control measures

Ask the “5 Why’s”

# Environmental Antecedent Examples

**People**



Lack of training on specific process

Lack of managerial oversight

Poor attitude/food safety culture

High employee turnover

Insignificant staffing

Lack of sick leave for good practices

Lack of needed supplies

Insignificant capacity of equipment

Improperly sized or installed equipment

Lack preventative maintenance on equipment

Poor facility layout

Equipment improperly used

Staff not following facility process

Insufficient process to mitigate hazard

Improperly used TCS/non-TCS food

# Applying the "5 Why's"

**Contributing factor:** Insufficient Cooking of ground beef (S-1) was identified

Why was the raw ground beef undercooked?

- **A new deli/pizza worker who was assigned to the cook line that night, undercooked the food**

Why did the pizza/deli worker undercook the food?

- **Worker stated he was not trained on the gill line prior to that evening**

Why was the pizza/deli worker not trained properly?

- **The manager forgot to go over the basic cooking protocols with the deli/pizza worker that evening**

Why did manager forget to inform the worker about the cooking protocols?

- **The manager was overwhelmed due to the shortage in staff that evening**

Why was there a staff shortage?

- **Manager stated that they cannot compete with salary demands necessary to keep a fully-staffed team on board**

# Poll Question 4

Which of the following environmental antecedent categories *best* represents the poorly trained and managed pizza/deli worker and the staffing challenges?

A. Food
B. People
C. Economics
D. People and Economics

# Applying the "5 Why's"

**Contributing factor:** Insufficient Cooking of ground beef (S-1) was identified

Q1: Why was the raw ground beef undercooked?

- **A1: Deli/pizza worker assigned to cook line that night who undercooked the food**

Q2: Why did the pizza/deli worker undercook the food?

- **A2: Worker stated he was not trained on the gill line prior to that evening**

POOR TRAINING

Q3: Why was the pizza/deli worker not trained properly?

- **A3: The manager forgot to inform the worker about the cooking protocols with the deli/pizza worker that evening**

LACK OF MANAGERIAL OVERSIGHT

Q4: Why did manager forget to inform the worker about the cooking protocols?

- **A4: The manager was overwhelmed due to the shortage in staff that evening**

Q5: Why was there a staff shortage?

- **A5: Manager stated that they cannot compete with the wage demands required to keep a fully-staffed team on board**

ECONOMICS

Equipment

Economics

Processes

Food

People

# Contributing Factor and Environmental Antecedent Examples

| AGENT | ENVIRONMENTAL FINDINGS | CONTRIBUTING FACTOR | ENVIRONMENTAL ANTECEDENT |
|---|---|---|---|
| E. coli | Burgers cooked to 140°F. Employee not trained. | Survival | Improper training (**People**) |
| Salmonella | Raw eggs used as ingredient for dressing. | Contamination | Contaminated ingredient (**Food**) |
| Norovirus | Poor handwashing due to lack of kitchen hand sink. | Contamination | Inadequate sinks available (**Equipment**) |
| C. Perfringens | Cooler holding food at 50°F. Repairs too costly. | Proliferation | Financial difficulties (**Economics**) |
| B. cereus | Inadequate acidification of sushi rice | Proliferation | Protocol not followed (**Process**) |

# Environmental Assessment

**Environmental Assessment:** The systems-based component of a foodborne illness outbreak response that fully describes how the environment contributed to the introduction and/or transmission of agents that cause illness or could cause illness – CDC NEARS

- Pre-Preparation
- Manager Interview
- Observation
- Sample Collection
- Record Collection
- Control Measures
- Reporting

# DATA-DRIVEN Assessments

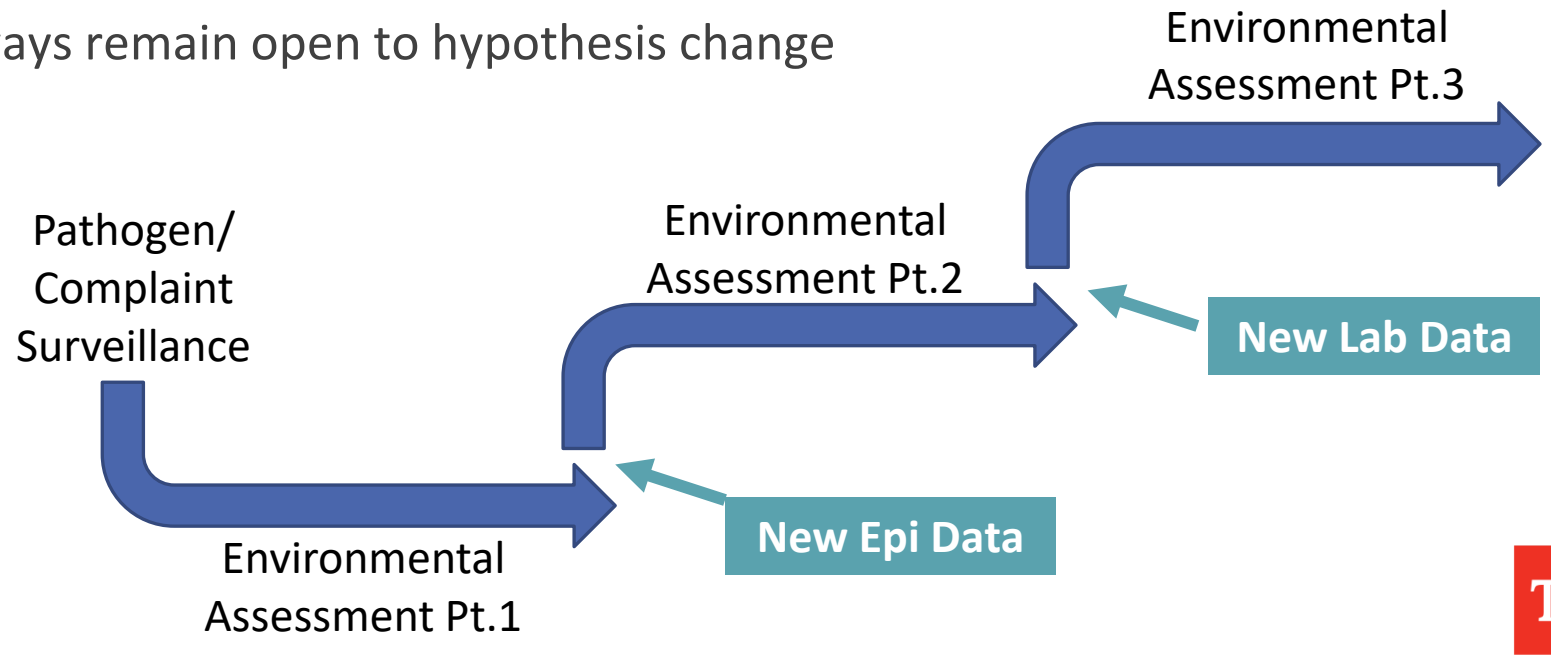
Outbreaks are always limited to information and data

Plan assessment activities around the data available

Assessments may require several visits, depending on new developments

Focus and direction may change significantly with new data

Always remain open to hypothesis change



# Preparing for the Assessment

**CONSULT WITH YOUR OUTBREAK TEAM**

- Examine available outbreak information
  - Causative agent
  - Onset of illness among cases
  - Likely exposure dates/meals/locations
  - Build a working hypothesis
- Collect food establishment information
  - Existing regulatory records
  - Menus, recipes, product formulations
  - Relationships among chain establishments
  - Consult with routine inspector
- Prepare a checklist of questions
  - Unusual events, equipment failures/repairs
  - Changes in processes or operations
  - Employee and customer feedback
  - Related processes, food, and conditions

# Manager Interview

Introduction
- Establish rapport
- Inform the manager of the purpose of visit

Avoid accusations

Avoid leading questions and bias

Consider communication barriers

Be prepared for potential questions
- Appropriate feedback – general outbreak information
- Inappropriate feedback – specific case information

# Establishment Observation

Should be conducted with manager or person in charge

Facilitates understanding of general layout, flow of food, and systems

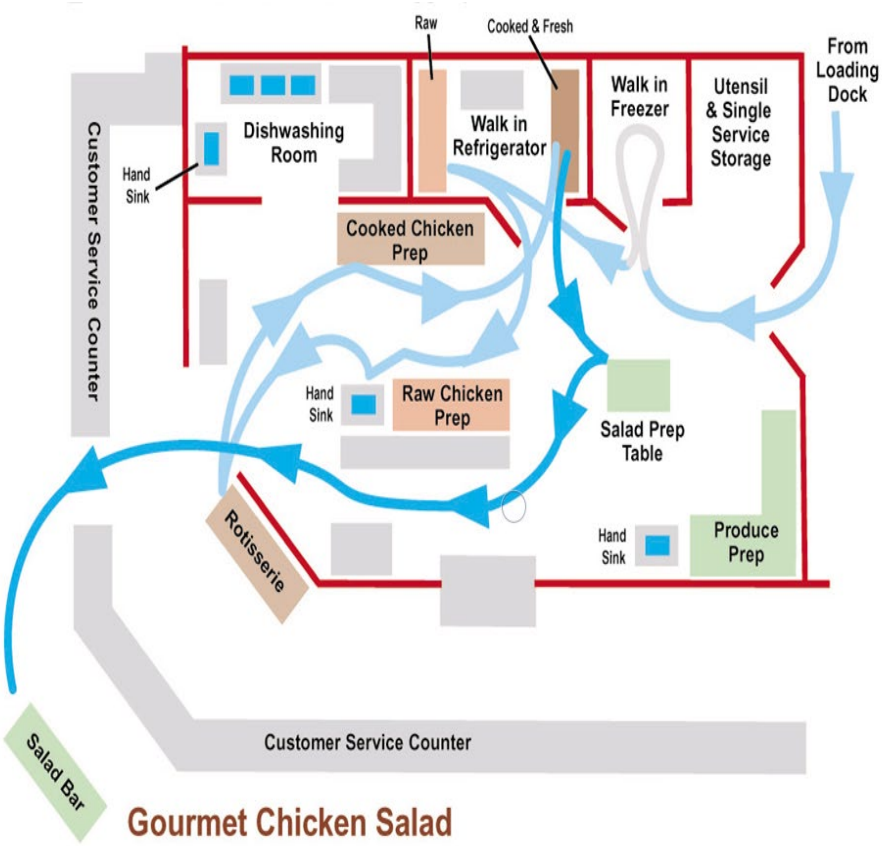
Collect objective data on foods or activities with epi signals

If pathogen driven response, focus may narrow on specific conditions or practices

If food or pathogen is not Epi/Lab implicated:

- Form a hypothesis and use critical thinking skills
- Focus on available data
- Commonly-associated pathogen/food/practice relationships

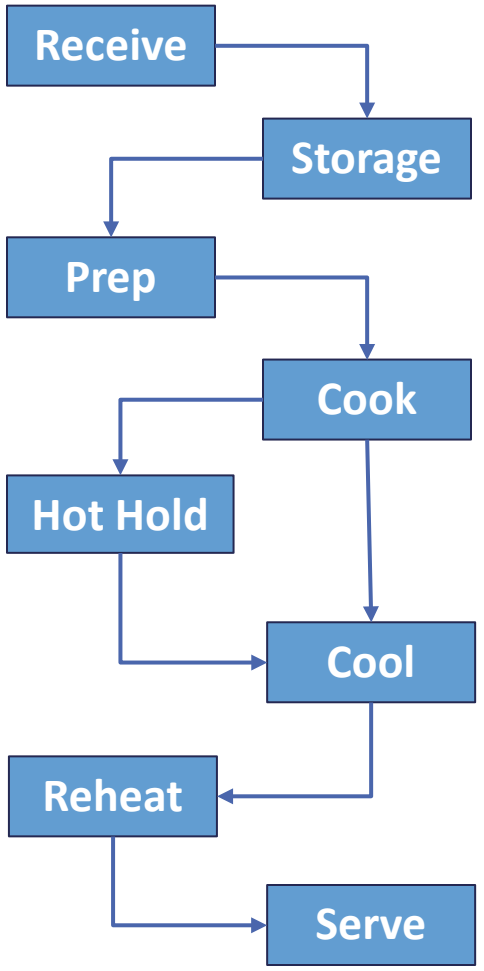
# General Facility Flow Diagram



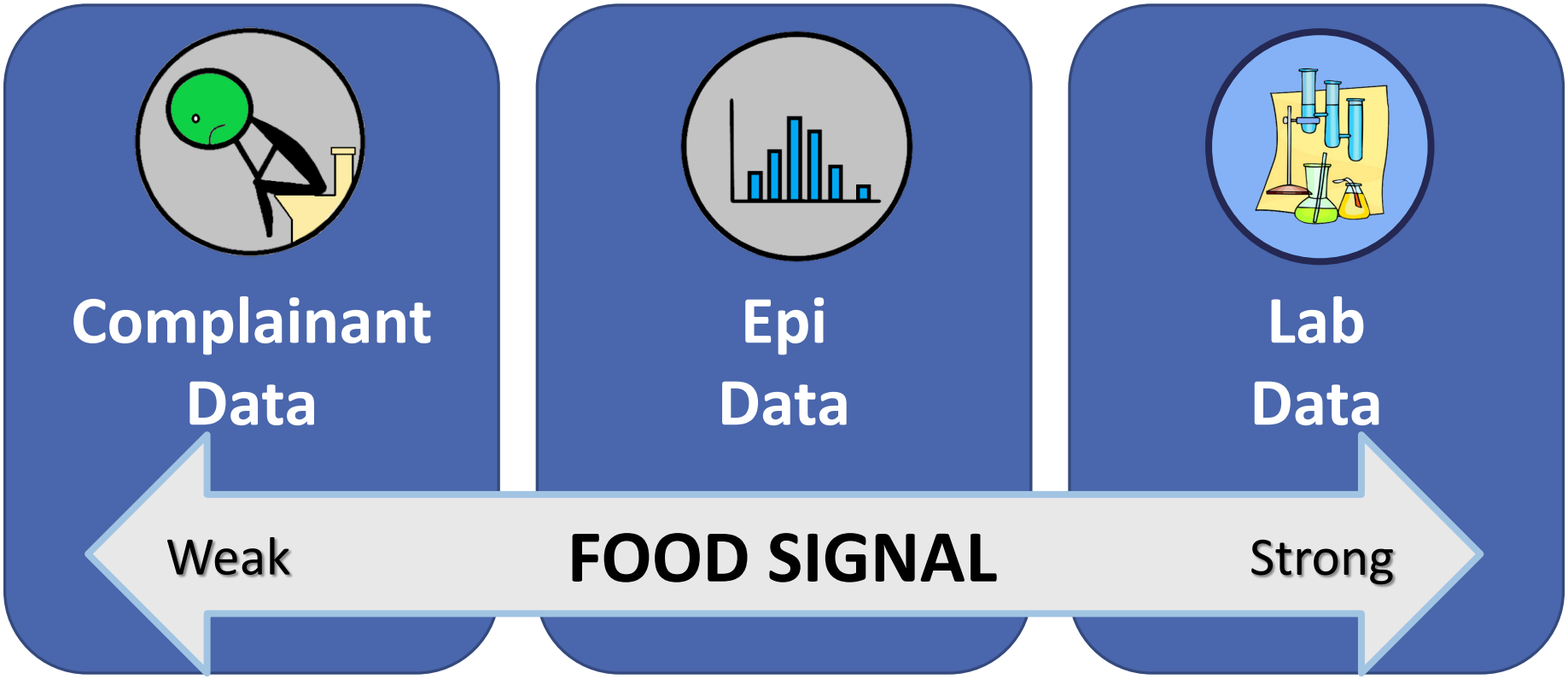

Source: Selman and Guzewich

# Specific Food Flows

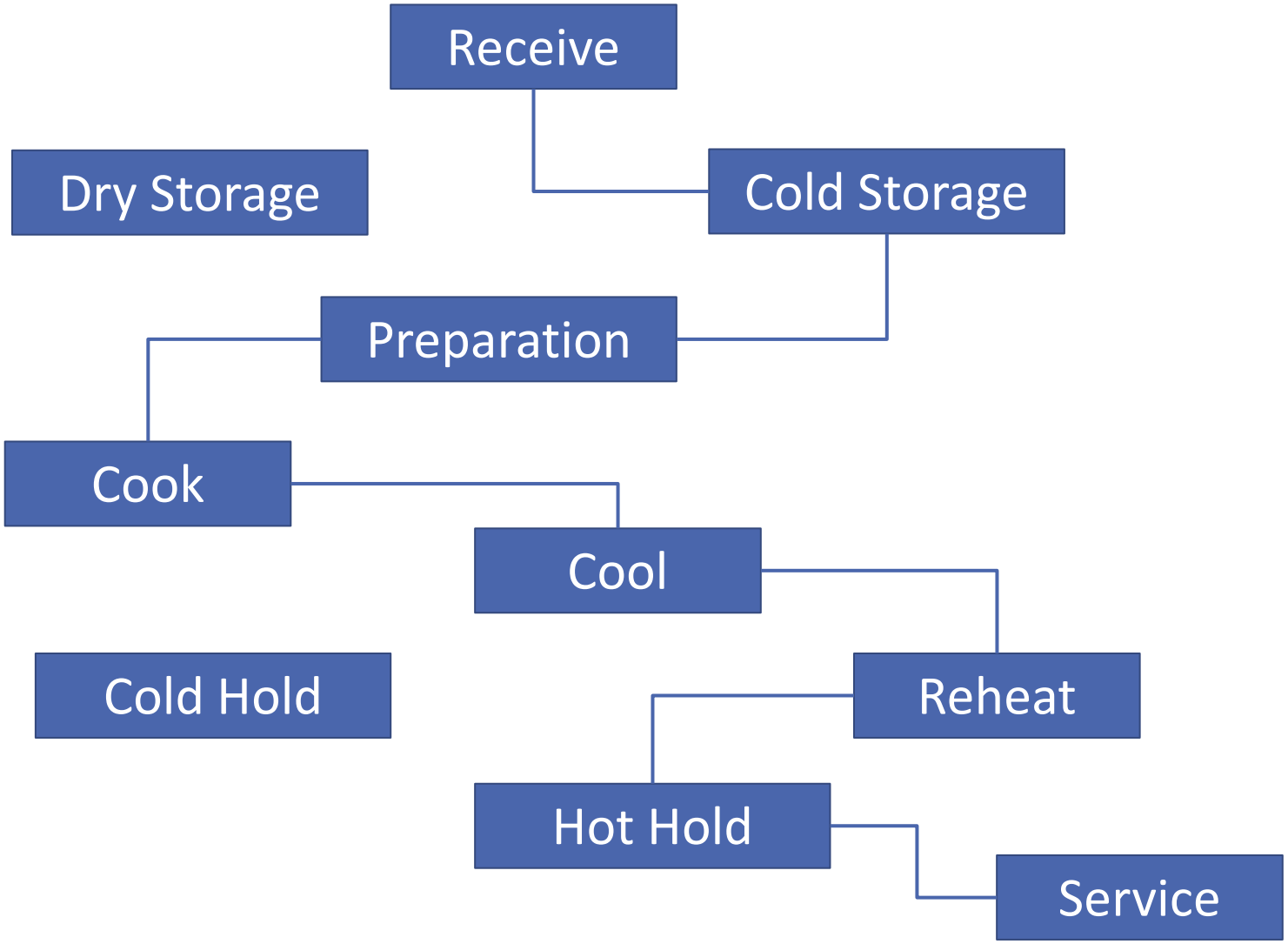
- ☑ Valuable for Complex multi-ingredient and/or multi-day prep food vehicles
- ☑ Provides insight into the people, processes, and ingredients
- ☑ Helps target specific steps for observation/recreation of events
- ☑ Can help rule in or rule out contributing factors
- ☑ Allow better insight into potential environmental antecedents
- ☑ Can help laser-focus control measures



# When is a food flow appropriate?



# Process Food Flows



# Specific Data for Each Step

Location within the facility

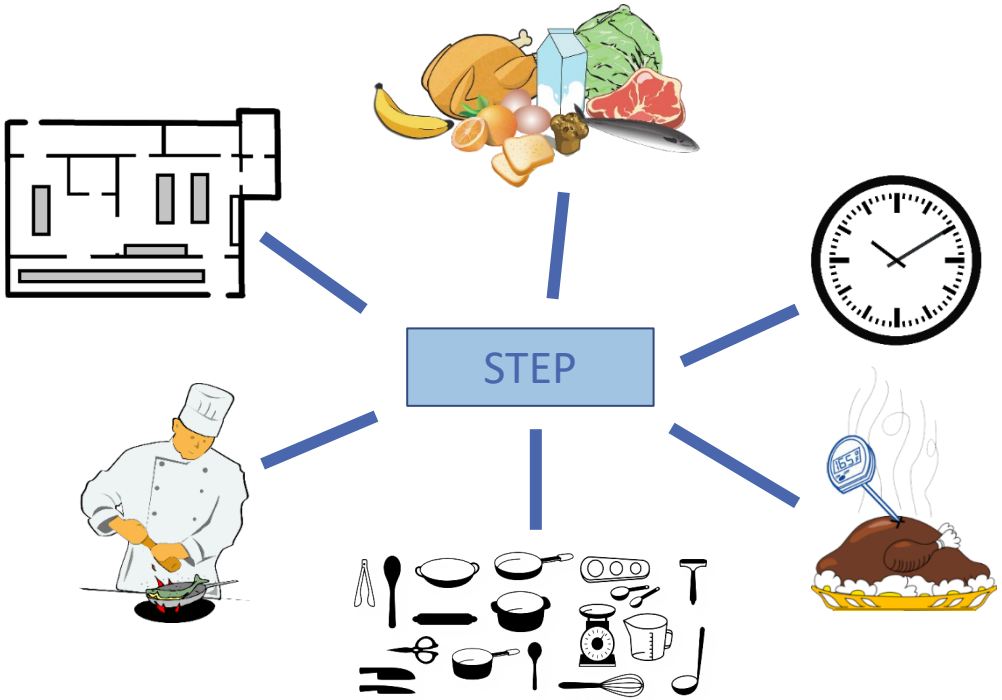
Specific ingredients

Date, time, and duration

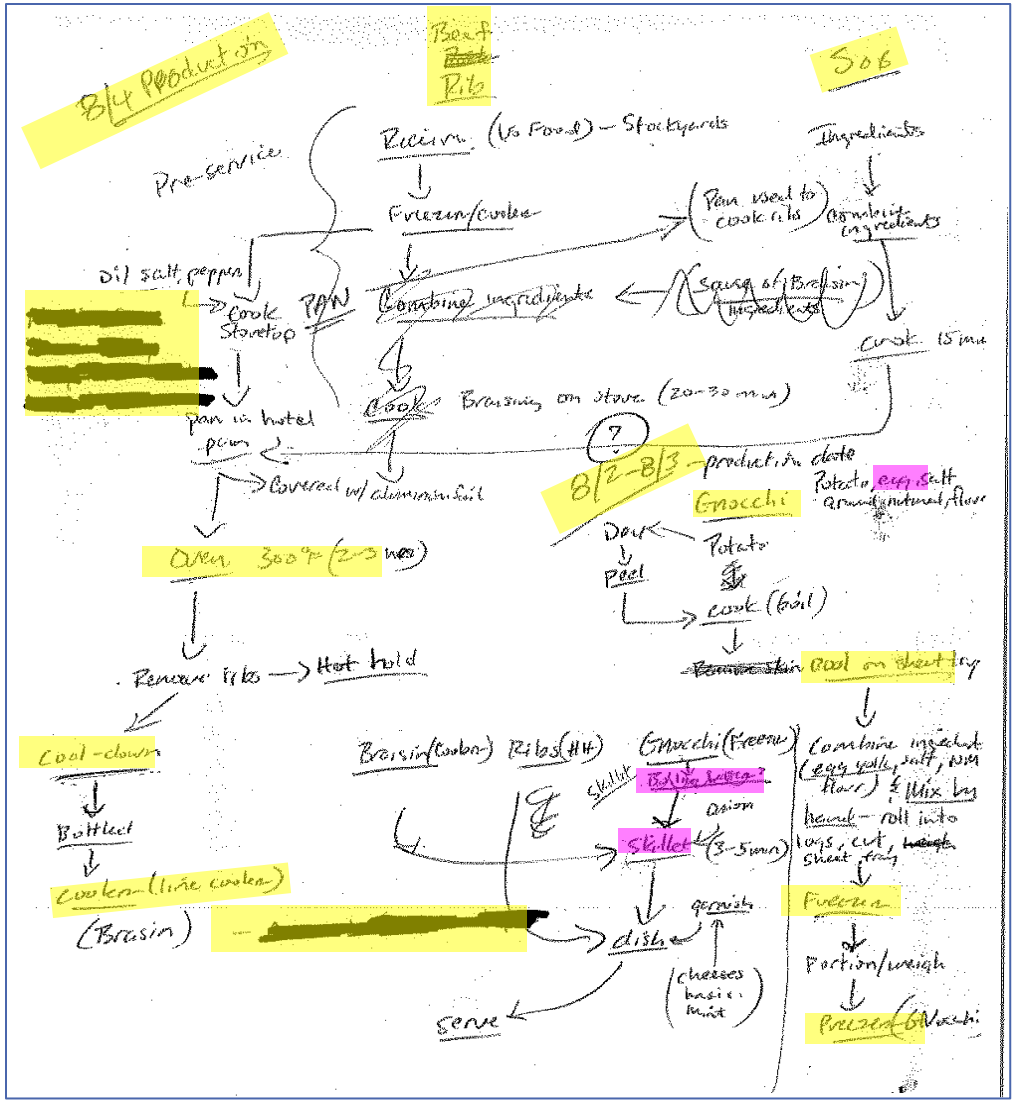
Critical limits

Equipment involved

People involved



# Food Flow Example



# Reconstruction of Events

- Helps to better understand what did and did not occur
- Visual observation of specific food preparation or activity
- May be broad (entire build) or narrowly focused (single step)
- Measure critical limits and document observations
- Focus on deviations from initial descriptions or provided protocols
- Other activities to consider during reconstruction of an event:
  - Employee interviews
  - Food sampling
  - Environmental sampling
  - Records collection

# Employee (worker) Interviews

Should occur as soon as possible

Target staff who made implicated food

Ask open-ended questions

Use food flow (if available) to assist

Interview workers in private

Take detailed notes

May be scheduled at later time

- Epi may request to conduct interviews
- Important to get contact information
- Ill employee data are subject to HIPAA

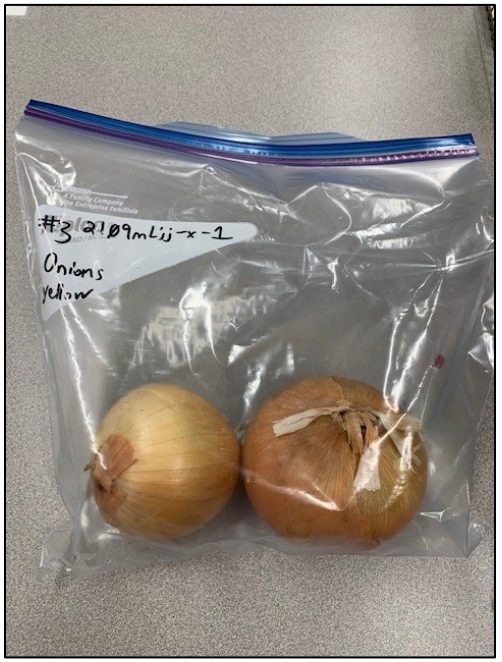
# Poll Question 5

Have you ever collected environmental samples?

A. Yes
B. No

# Sampling

- Stool Specimens
- Food Samples
- Water Samples
- Environmental Samples




# Environmental Surface Sampling

- Environmental sampling can be a powerful tool to support the outbreak investigation
- Collaborate with laboratory **before** an outbreak occurs to determine:
  - Proper methodology
  - Proper swab materials to use
  - Proper transportation and storage
  - Chain-of-Custody (COC)
- Collaborate with laboratory **during** outbreak to determine:
  - If sampling is appropriate
  - How many swabs to collect
  - When to expect delivery of samples to the lab
  - Confirm appropriate tools and delivery method

# Environmental Sampling Considerations

Planning and Preparation

- Coordinate and Communicate with Epi and Lab
  - What to Sample
  - Where to Sample
  - When will they arrive at the Lab
- Supplies
  - Sterile
  - Swabs vs Sponges
  - Make Sure they are not Expired
- Procedures
  - Aseptic?
- Team
  - Establish and Bring a Sampling Team

# Environmental Sampling Steps

## Site Visit

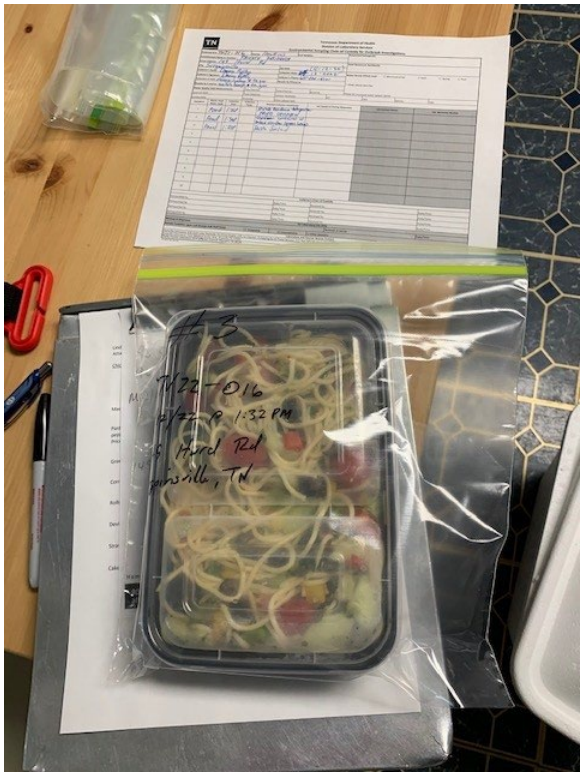
- **Observe**
  - Walk through the facility
  - Identify Worker Practices
  - Identify Areas of Concern
- **Interview Workers**
  - Review What You See vs What They Say
- **Identify locations**
  - Bases on Your Epi, Lab, EH Coordination
  - Based on Interview and Observations
- **Conduct Sampling**
- **Wrap Up and Submission**

# Food, Water, and Stool Collection

Have a plan in advance
- Appropriate collection forms
- Necessary collection tools
- Appropriate training on collection methods
- Consider logistics and preservation of samples

Holding food or water samples
- Hold notices should be well understood
- Best to obtain possession

Consult with laboratory services
- Amounts needed
- Appropriate storage
- Transportation



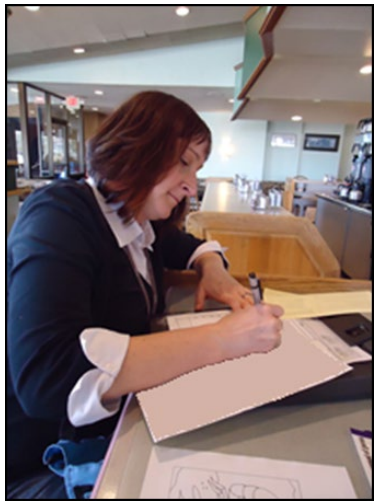
Communication with partnering regulatory agencies if will be receiving samples

# Record Collection

What records are needed?
- Consult with outbreak team
- Epi, Lab, and partnering agencies may have special requests

Collect records as soon as possible
- May be removed or disappear in time

Make use of cameras where appropriated
- Facilitate quick communication
- Beware of people and branding

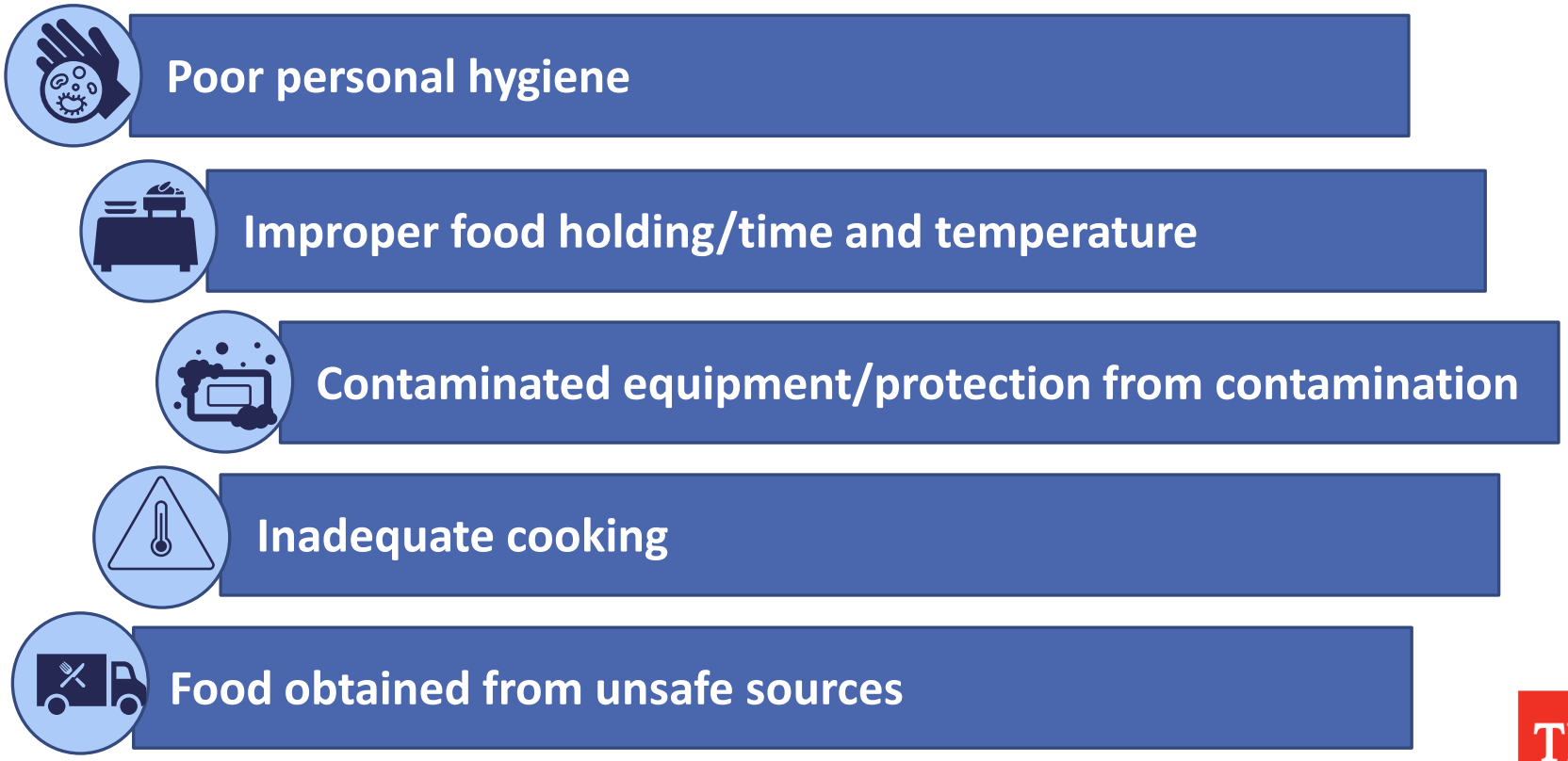


- **Menu**
- **Recipes**
- **Food labels**
- **Food receipts, invoices**
- **Customer receipts**
- **Catering or delivery orders**
- **Temperature, pH, acidity, time, sanitizer logs**
- **Illness policies**
- **Employee names**
- **Employee attendance records**
- **Sanitation policies**
- **Food preparation policies**
- **Numbers of meals served**

# What if a contributing factor is not identified?

Implement general control measures

- Target Risk Factors for foodborne illness



# Short and Long-Term Controls

**Short-Term (immediate)**

Address contributing factor(s)

- Hold
- Seize
- Cease/desist
- License sanctions
- Menu limitations
- Food embargo
- Closure
- Worker exclusion or restriction
- Food recalls

**Long-Term**

May be specific to environmental antecedents

- Risk control plan
- HACCP plan
- Training
- Menu modifications
- Process modifications
- Equipment changes
- Supplier modifications
- Increase follow-up inspection frequency

# Risk Control Plan

## Risk Control Plan

**Establishment Name:** [redacted] **Type of Facility:** Full Service Risk 2

**Address:** [redacted] **City:** Nashville **State:** TN **Zip:** NA **County:** Davidson

**Time In:** 10:20 AM **Time Out**: 12:15 PM **Date:** 8-4-17 **Inspector's Name:** Danny Ripley

**Specific observation noted during inspection:**

Employees were observed touching raw foods (breaking eggs) then touching ready-to-eat (RTE) foods without removing gloves, hand washing and daunting new gloves.

**Applicable code violation(s):** Personal Cleanliness (Rule 1200-23-01-.02(3)(a-d)
Preventing food contamination (Rule 1200-23-01-.03(b)
Gloves – use limitation (Rule 1200-23-01-.03-(d)(5)

**Risk factor to be controlled:** Cross-contamination from raw animal food to RTE food through contaminated surfaces.

**Hazard:** Salmonella spp.

**What must be achieved to gain compliance in the future:**

All surfaces that contact raw animal foods, including raw eggs, must be protected to prevent cross-contamination with clean food-contact surfaces and RTE food. This may be accomplished in-part through training, hand washing, proper glove use and sanitization of food contact surfaces.

**How will active managerial control be achieved:**

The following activities will be conducted:

- Mandatory training for all kitchen employees
  - Glove use, sanitizing, hand washing, touch points and raw food handling
  - Training will be incorporated during orientation and routinely during pre-shift meetings. Demonstration hand washing training will occur at set intervals during the year.
- Job-specific designations for cook-line employees
  - Designate an employee for handling raw foods and equipment used for raw food production only.
  - Designate employees for handling RTE food and clean food equipment.
  - Identify utensils used for raw animal food production. These utensils will be color-coded and my not be handled by RTE employees.
- Designate lead line employee to oversee sanitizer bucket set-up and use.

**How will the results of implementing the RCP be communicated back to the regulatory authority:**

All persons receiving training will be entered into a training log. Each log will include date, subject and employee name. Training logs will be maintained by management and updated after each training event. These logs will be shared with the inspector during routine inspections.

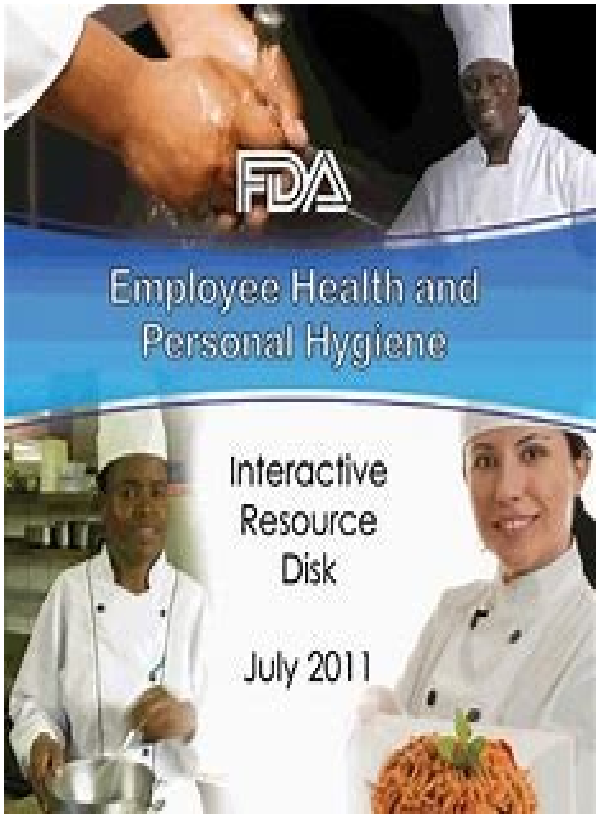
As the person in charge of the IHOP located at 4098 Nolensville Rd, I have voluntarily developed this risk control plan, in consultation with the Metro Public Health Department and understand the provisions of this plan.

Establishment Manager _____ Date_____

Regulatory Authority_____ Date_____

# Restriction or Exclusion of Ill Food Employees

- Exclude from work or restrict from food preparation based on the disease-causing agent
- Follow state and local guidance where applicable
- FDA food code has a section on food employee exclusion and restriction
- Exclusions and restrictions may not be adequate in all situations - Norovirus




https://www.fda.gov/downloads/Food/GuidanceRegulation/RetailFoodProtection/IndustryandRegulatoryAssistanceandTrainingResources/UCM194575.pdf

# Communication of Findings

Observation and interview data must be well-documented

- May become evidentiary
- Must be professional and legible
- Should be summarized and shared with outbreak team frequently
- Findings should be summarized

Contributing factor data should be consistent with Epi reports

- Ensure collaboration during final reporting
- Contributing factor should make sense

Environmental data from epi reports should match Environmental reports

- Ensure EH has input regarding contributing factors
- Ensure EH participates in final summary reporting

# NEARS

National Environmental Assessment Reporting System (NEARS)

Study of characteristics associated with outbreak establishments

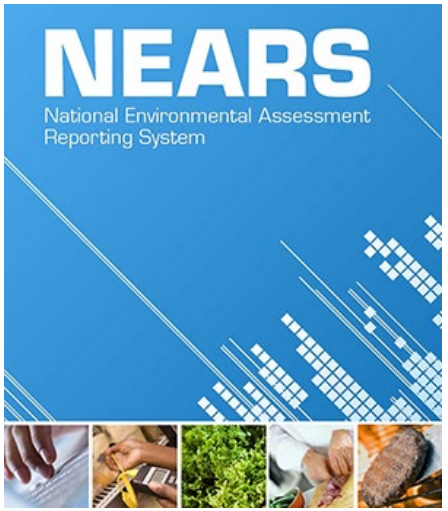
Provides information that contribute to food safety

Local and state EHS collect and contribute data

Help meet FDA Retail Food Standard 5

Not an environmental assessment

Seven-part formal data collection instrument



# Traceback and Traceforward Investigations

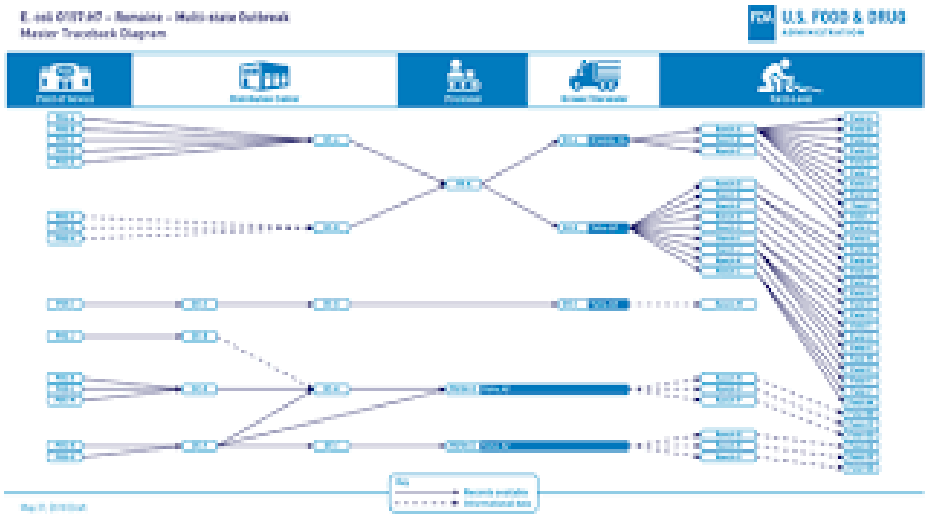
The processes of following a food from point-of-service to source; then following from source to additional points-of-service

Purpose

- Determine source of contamination
- Facilitate recall efforts
- Find additional illnesses
- Test hypothesis about source

Two Categories

- Investigational Traceback Investigation
- Regulatory (Formal) Traceback Investigation

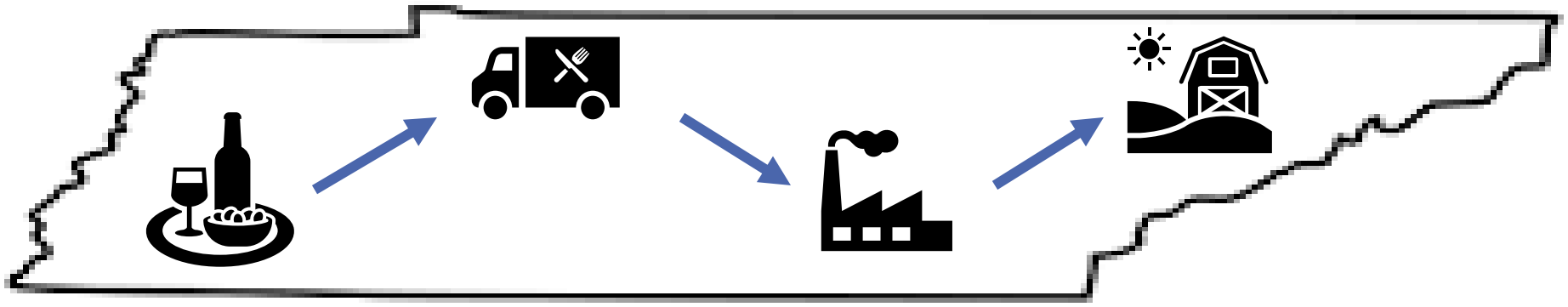


# Investigational Traceback

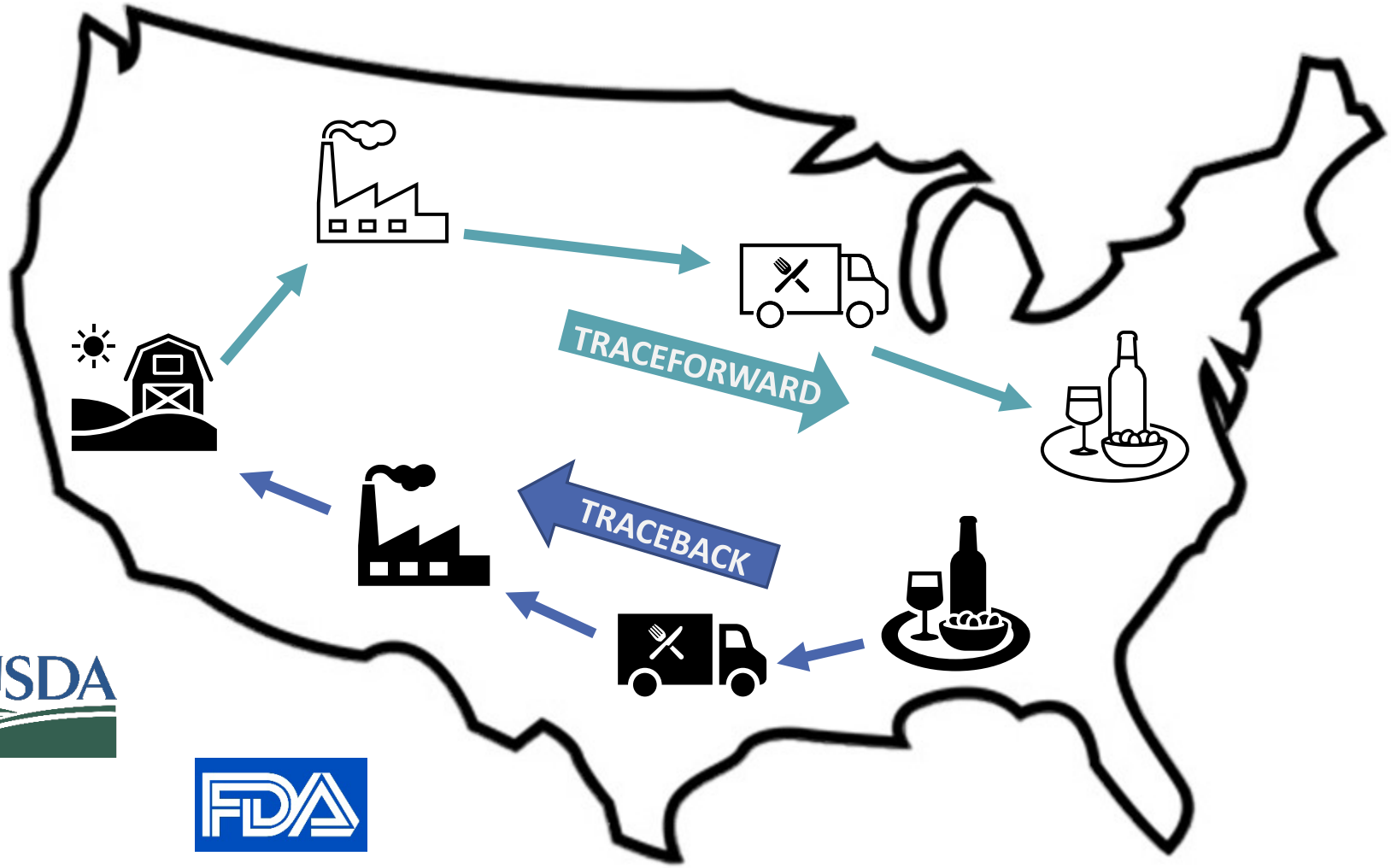
Local or State Agency Involvement (TDH, TDA, Metro's)

Informational or rapid source tracing

Strong laboratory, epi, and environmental evidence needed to initiate



# Regulatory Traceback Investigations




USDA

FDA

TN

# Role of Local Health Departments

Your investigation could herald a multi-state investigation and traceback investigation

Your investigation should

- Implicate specific food item(s)
- Rule out point-of-service contamination

Interview cases for product details and where they purchased the food

Collect paperwork (e.g., receipts, invoices, shipping documents) from retail food establishments

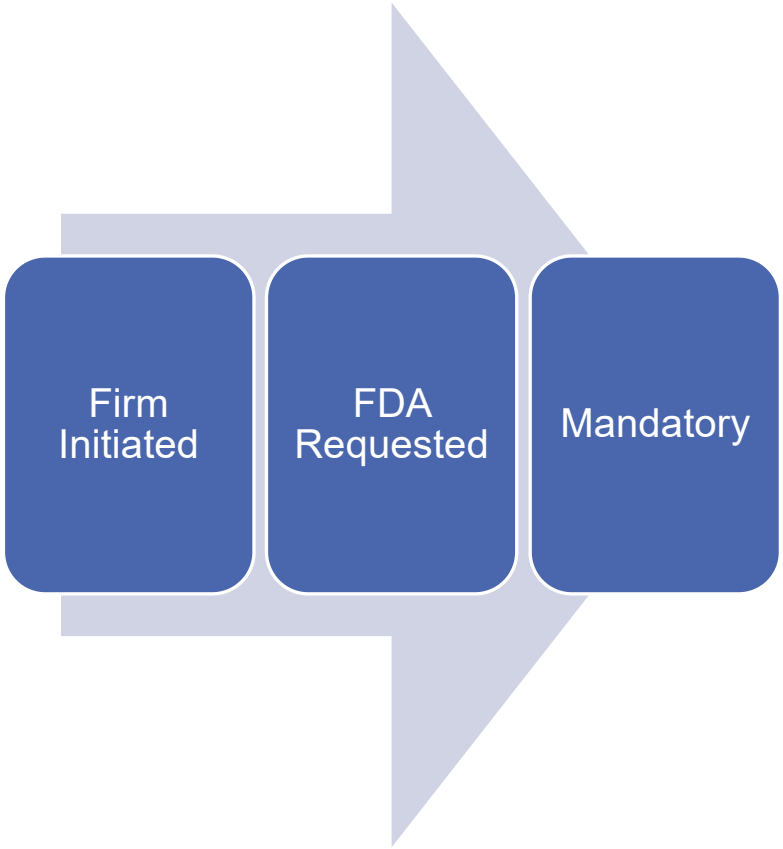
Communicate findings to appropriate partnering agencies

# Poll Question 6

Which of the following must occur before a regulatory traceback investigation can occur?

A. A food/ingredient must be implicated
B. Records must connect the implicated food with the point of service
C. Contamination at point of service must be ruled out
D. All of the above

# Product Recall




Class 1: Will cause serious adverse health consequences or death

Class 2: The probability of serious adverse health consequences is remote

Class 3: The product is not likely to cause adverse health consequences

# Environmental Assessment Tools and Training Products

Integrated Food Safety Centers of Excellence

- https://www.cdc.gov/foodsafety/centers/index.html

Environmental Health Specialist Network

- https://www.cdc.gov/nceh/ehs/ehsnet/resources/index.htm
- https://www.cdc.gov/nceh/ehs/nears/index.htm
- https://www.cdc.gov/nceh/ehs/elearn/eats/index.html

Food and Drug Administration

- https://www.fda.gov/media/123908/download

Association of Food and Drug Officials

- https://www.afdo.org/resources/sampling-resources/

Council to Improve Foodborne Outbreak Response

- https://cifor.us/downloads/clearinghouse/CIFOR-Guidelines-Complete-third-Ed.-FINAL.pdf

International Association for Food Protection Procedures to Investigate Foodborne Illness – 6th Edition

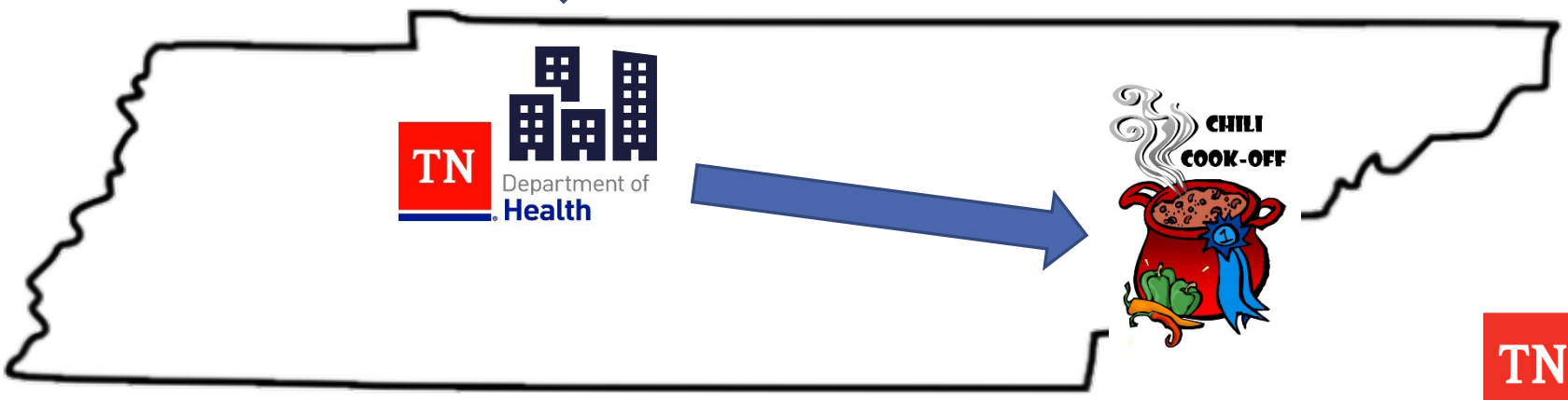
# November 2020
# Chili Cook-off Outbreak Involving *Salmonella* Muenchen

# Foothills of Great Smoky Mountains

# Outbreak Identification

USDA United States Department of Agriculture

**eCCF - Electronic Consumer Complaint Reporting Form**



# Background

Annual 1-day event

November 12, 2020

5:00 – 8:00PM

30-year history

13 local competitors


Over a 1000 consumers/participants

# Epi Investigation

Contact Chamber of Commerce

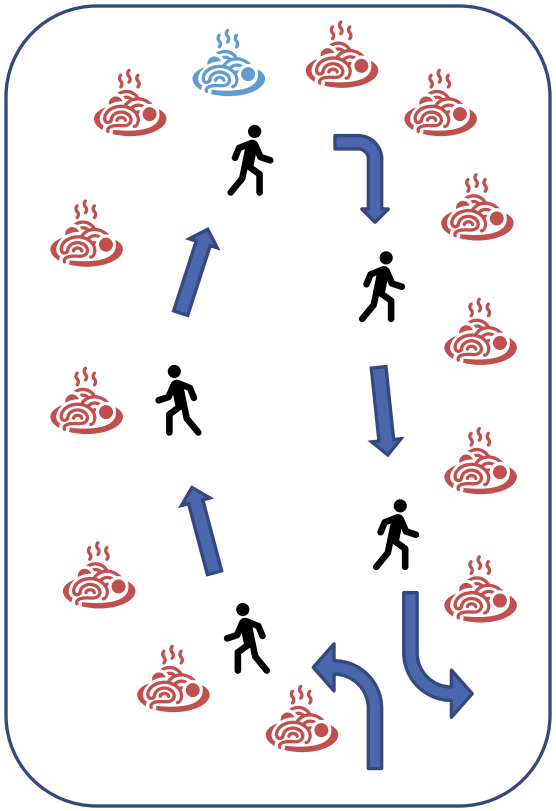
Acquired registration contact list

Event-specific questionnaire emailed to participants

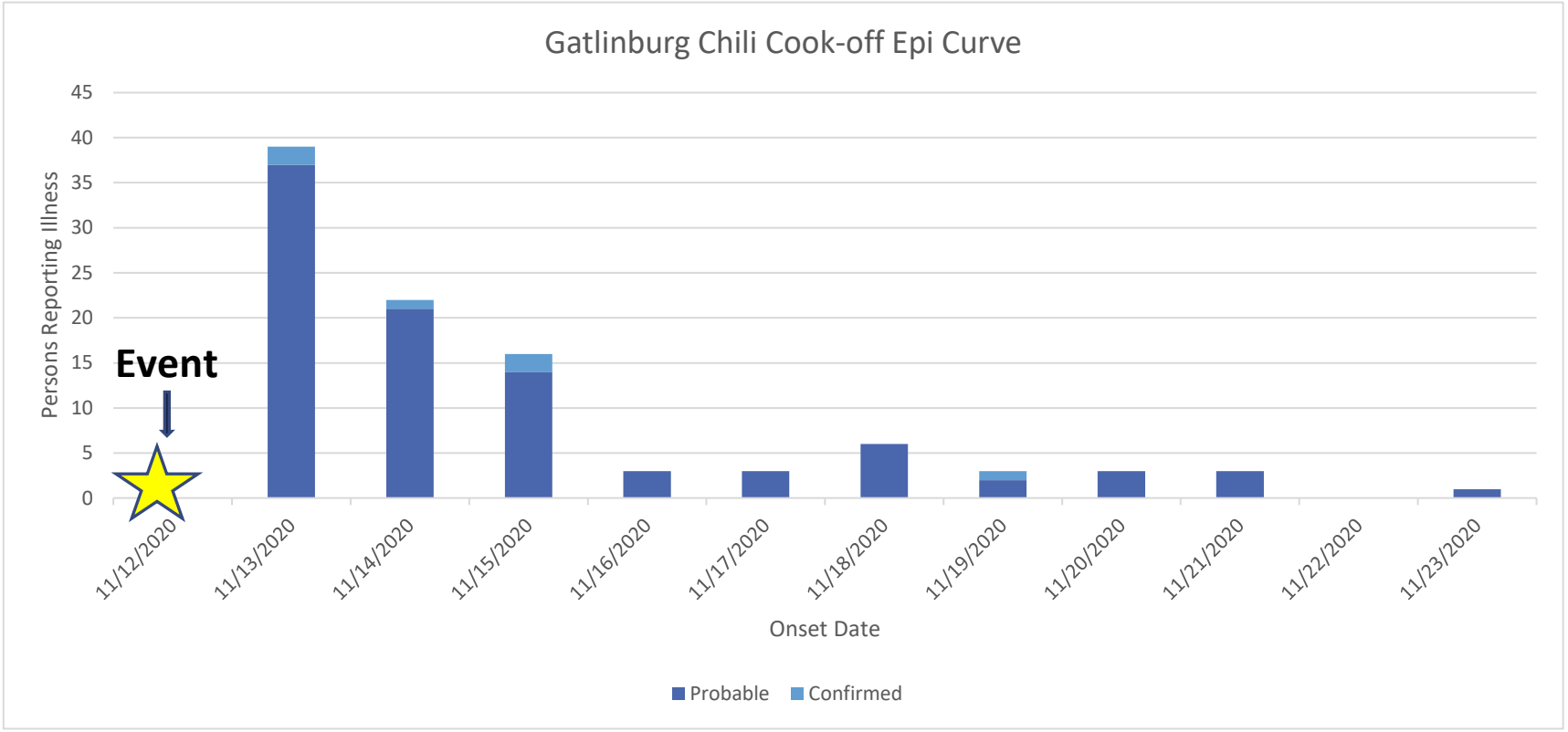
Case-control Study

- Univariate analysis
- Bivariate analysis
- Multivariate logistic regression analysis

Case – Salmonella symptoms, November 13-24, attended chili cook-off



# Epi Curve


Gatlinburg Chili Cook-off Epi Curve
Persons Reporting Illness
45
40
35
30
25
20
15
10
5
0
Event
11/12/2020
11/13/2020
11/14/2020
11/15/2020
11/16/2020
11/17/2020
11/18/2020
11/19/2020
11/20/2020
11/21/2020
11/22/2020
11/23/2020
Onset Date
Probable
Confirmed

# Exposure Analysis

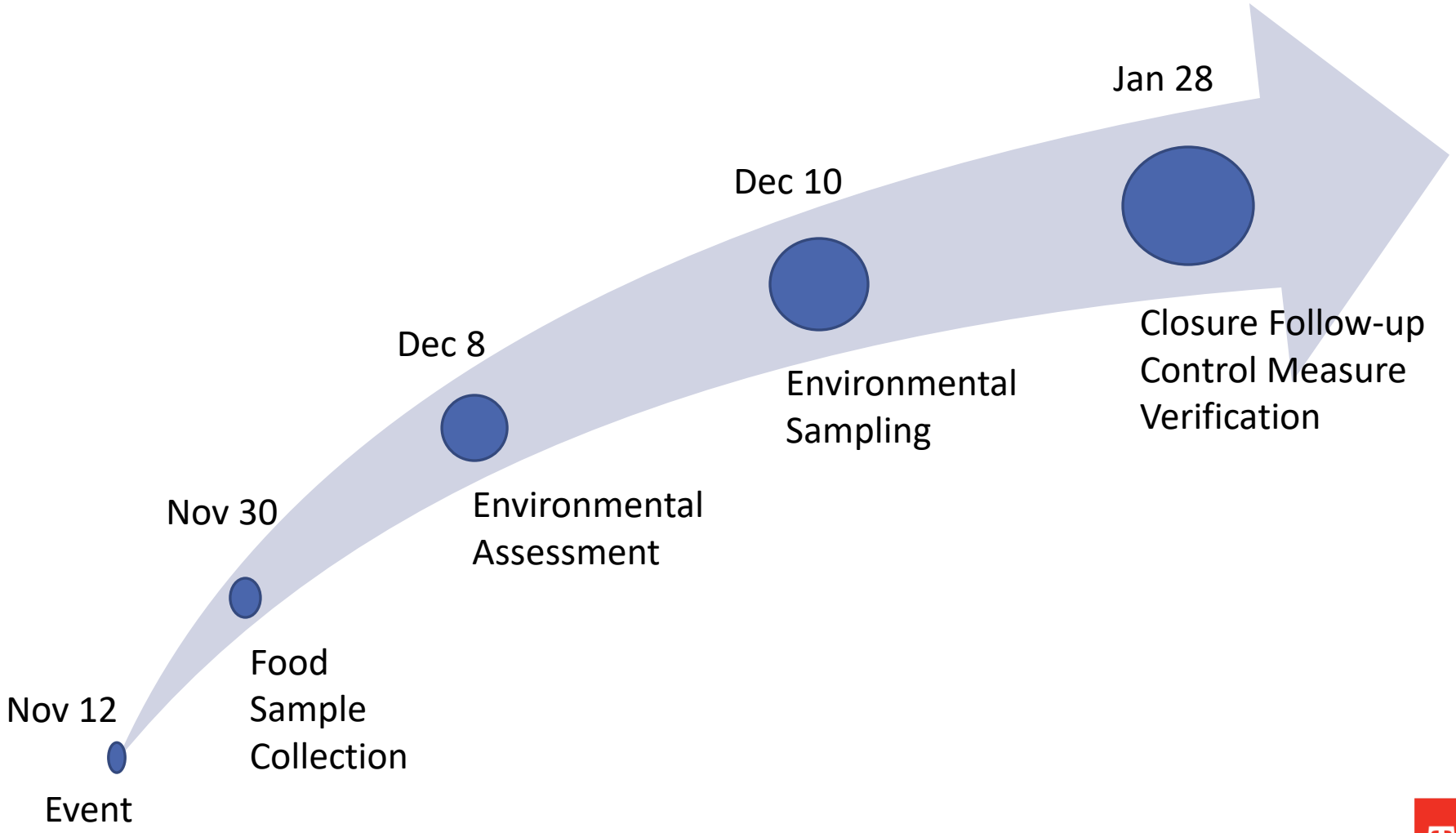
| All information is current as of 12/20/2020 at 1300 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Analysis Excludes Missing Responses | | | | | | | | |
| Exposure | Number Ill | | Number Not Ill | | Odds Ratio | 95% Confidence Interval | | Chi-Square p-value |
| | Exposed | Not Exposed | Exposed | Not Exposed | | Lower Limit | Upper Limit | |
| Rest A | 84 | 11 | 134 | 33 | 1.88 | 0.90 | 3.92 | 0.0885 |
| Rest B | 85 | 10 | 127 | 35 | 2.34 | 1.10 | 4.98 | 0.0241 |
| Rest C | 76 | 16 | 101 | 55 | 2.59 | 1.38 | 4.86 | 0.0026 |
| **Rest D** | **84** | **12** | **109** | **50** | **3.21** | **1.61** | **6.41** | **0.0006** |
| Rest E | 87 | 8 | 138 | 26 | 2.05 | 0.89 | 4.73 | 0.0878 |
| Rest F | 87 | 7 | 132 | 29 | 2.73 | 1.15 | 6.51 | 0.0194 |
| Rest G | 76 | 18 | 124 | 33 | 1.12 | 0.59 | 2.13 | 0.7215 |
| Rest H | 75 | 19 | 126 | 39 | 1.22 | 0.66 | 2.27 | 0.5251 |
| Rest I | 83 | 10 | 129 | 37 | 2.38 | 1.12 | 5.04 | 0.0208 |
| Rest J | 76 | 17 | 121 | 43 | 1.59 | 0.85 | 2.98 | 0.1482 |
| Rest K | 77 | 16 | 107 | 50 | 2.25 | 1.19 | 4.24 | 0.0111 |
| Rest L | 71 | 20 | 105 | 58 | 1.96 | 1.09 | 3.54 | 0.0242 |
| Rest M | 77 | 18 | 129 | 34 | 1.13 | 0.60 | 2.13 | 0.7120 |

# Multivariate Analysis

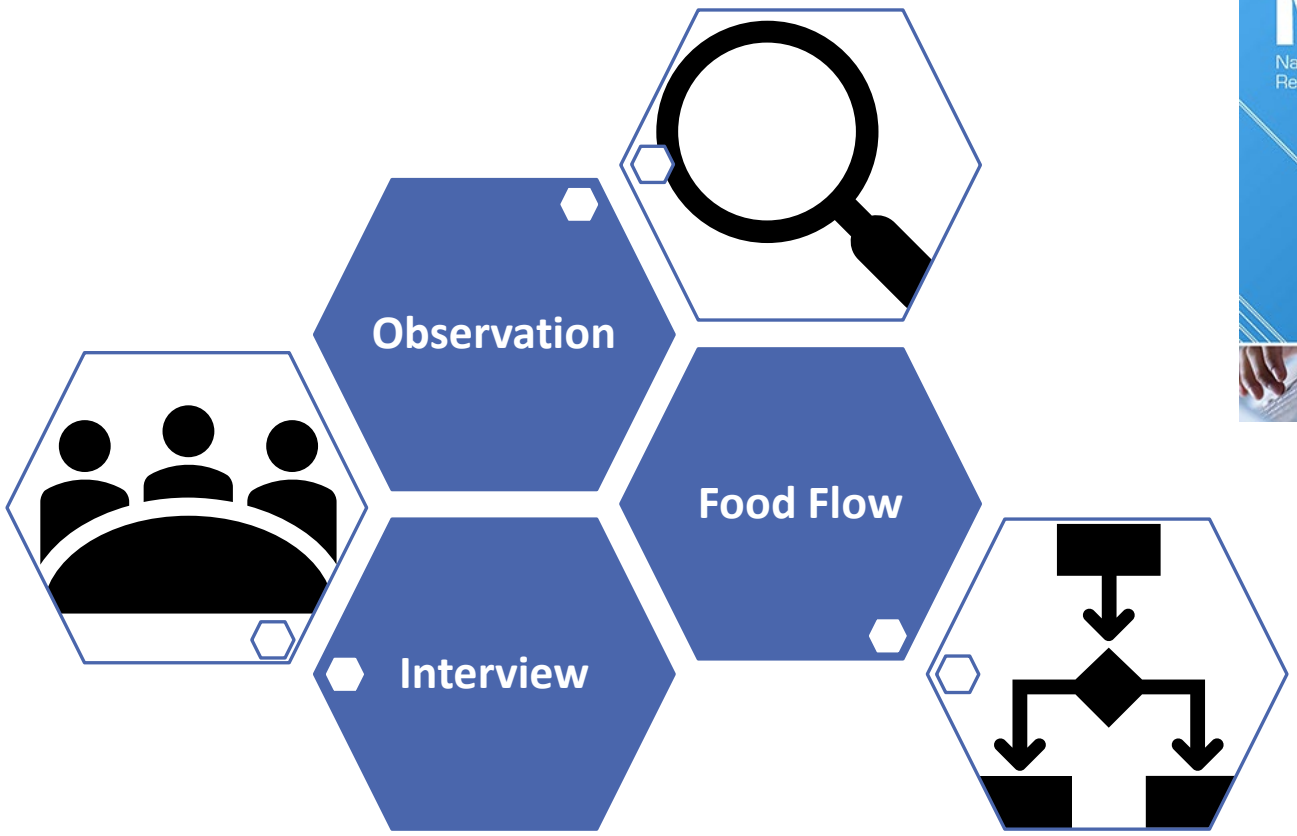
| Analysis Excludes Missing Responses | | | | |
|---|---|---|---|---|
| Logistic Regression including All Exposures | | | | |
| Exposure (n=209) | Odds Ratio | 95% Confidence Interval | | Chi-Square p-value |
| | | Lower Limit | Upper Limit | |
| Rest A | 1.42 | 0.54 | 3.76 | 0.4769 |
| Rest B | 1.10 | 0.38 | 3.20 | 0.8654 |
| Rest C | 2.11 | 0.761 | 5.829 | 0.1514 |
| **Rest D** | **3.50** | **1.23** | **9.94** | **0.0188** |
| Rest E | 1.77 | 0.56 | 5.57 | 0.3276 |
| Rest F | 2.08 | 0.55 | 7.87 | 0.2803 |
| Rest G | 0.33 | 0.12 | 0.95 | 0.0393 |
| Rest H | 0.39 | 0.14 | 1.08 | 0.0701 |
| Rest I | 1.73 | 0.61 | 4.90 | 0.3059 |
| Rest J | 0.55 | 0.20 | 1.49 | 0.2380 |
| Rest K | 1.48 | 0.50 | 4.44 | 0.4820 |
| Rest L | 0.81 | 0.36 | 1.79 | 0.5950 |
| Rest M | 0.84 | 0.35 | 2.02 | 0.7007 |
| Late Arrival - After 6:00PM | 1.96 | 0.99 | 3.88 | 0.0544 |

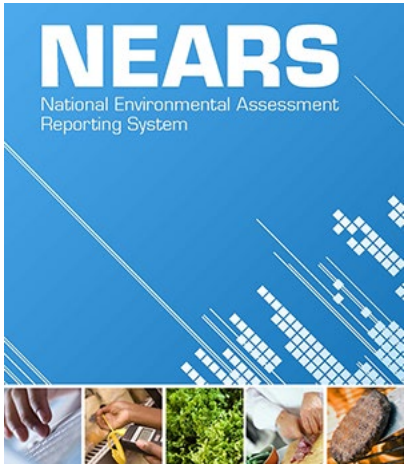
*The odds of having eaten at restaurant D is 3.5 times higher among those that are ill as compared to those that are not ill, with a 95% confidence the true value lies between 1.23 and 9.94.*

# Environmental Investigation Overview

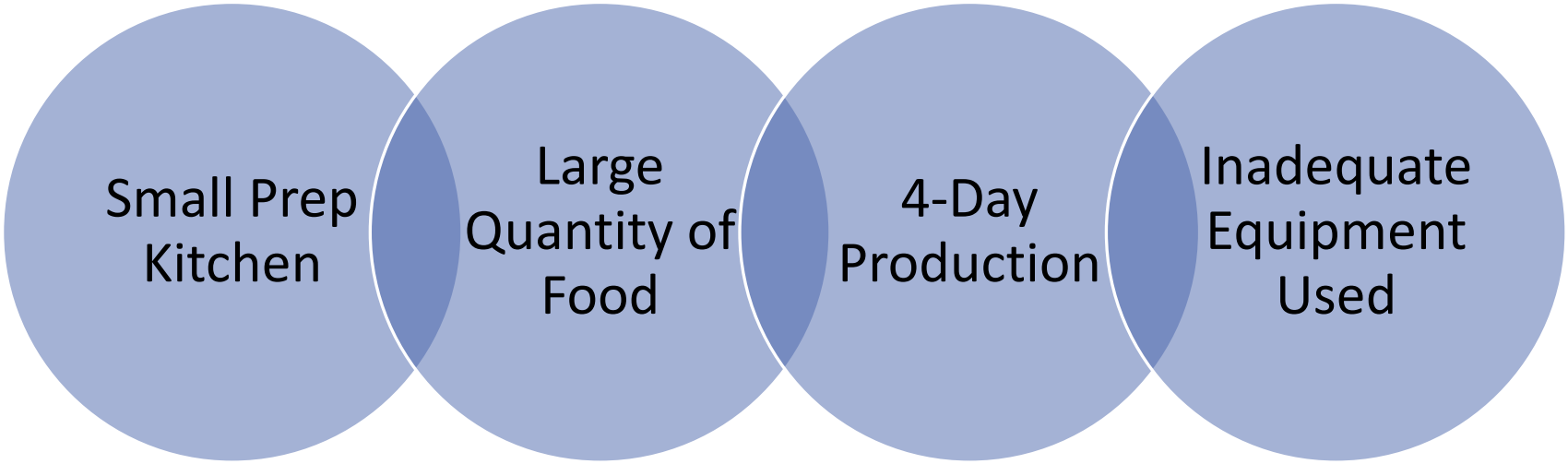


# Environmental Assessment

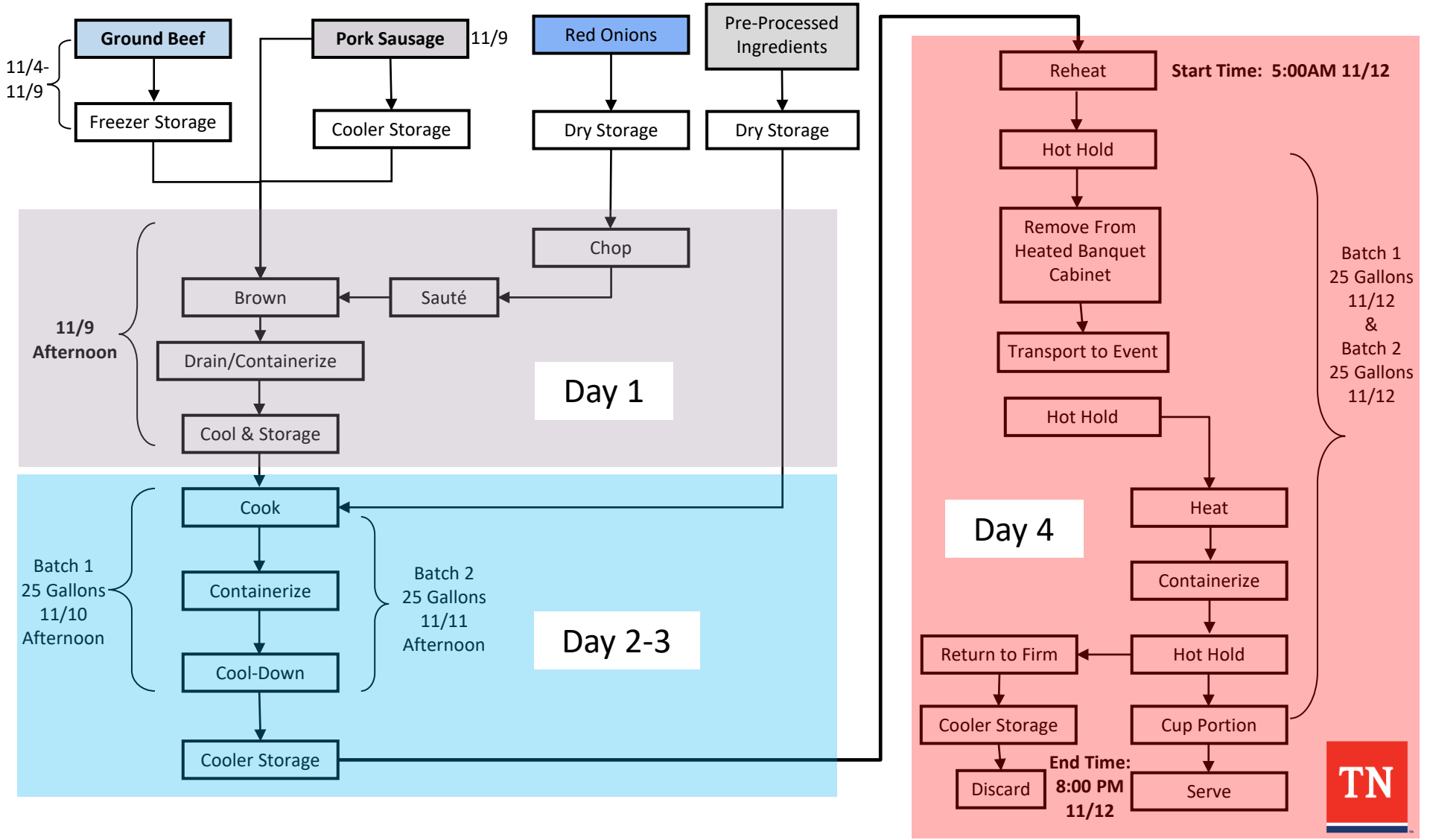


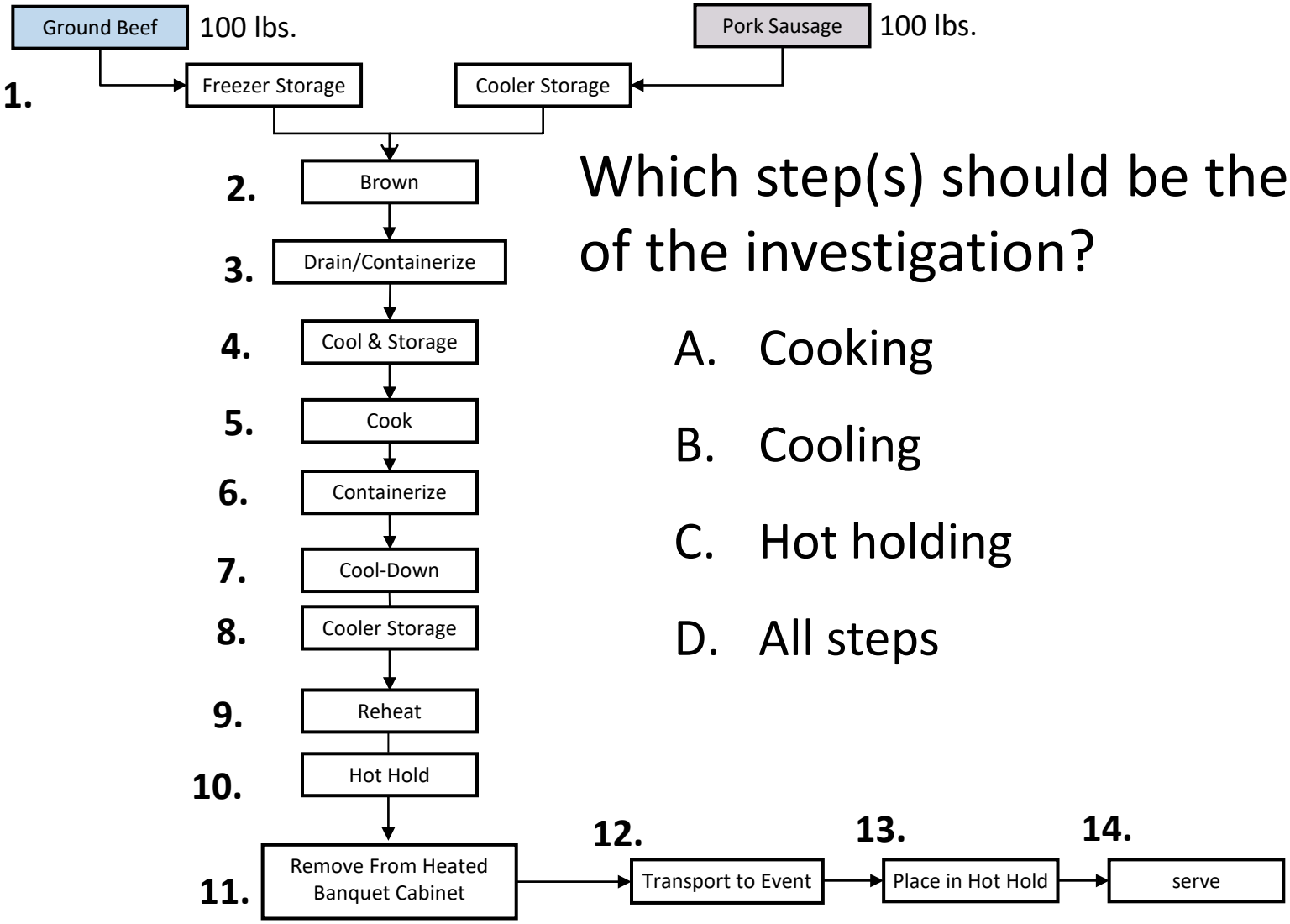
# Production Characteristics



# Chili Food Flow



# Poll Question 7




Which step(s) should be the focus of the investigation?

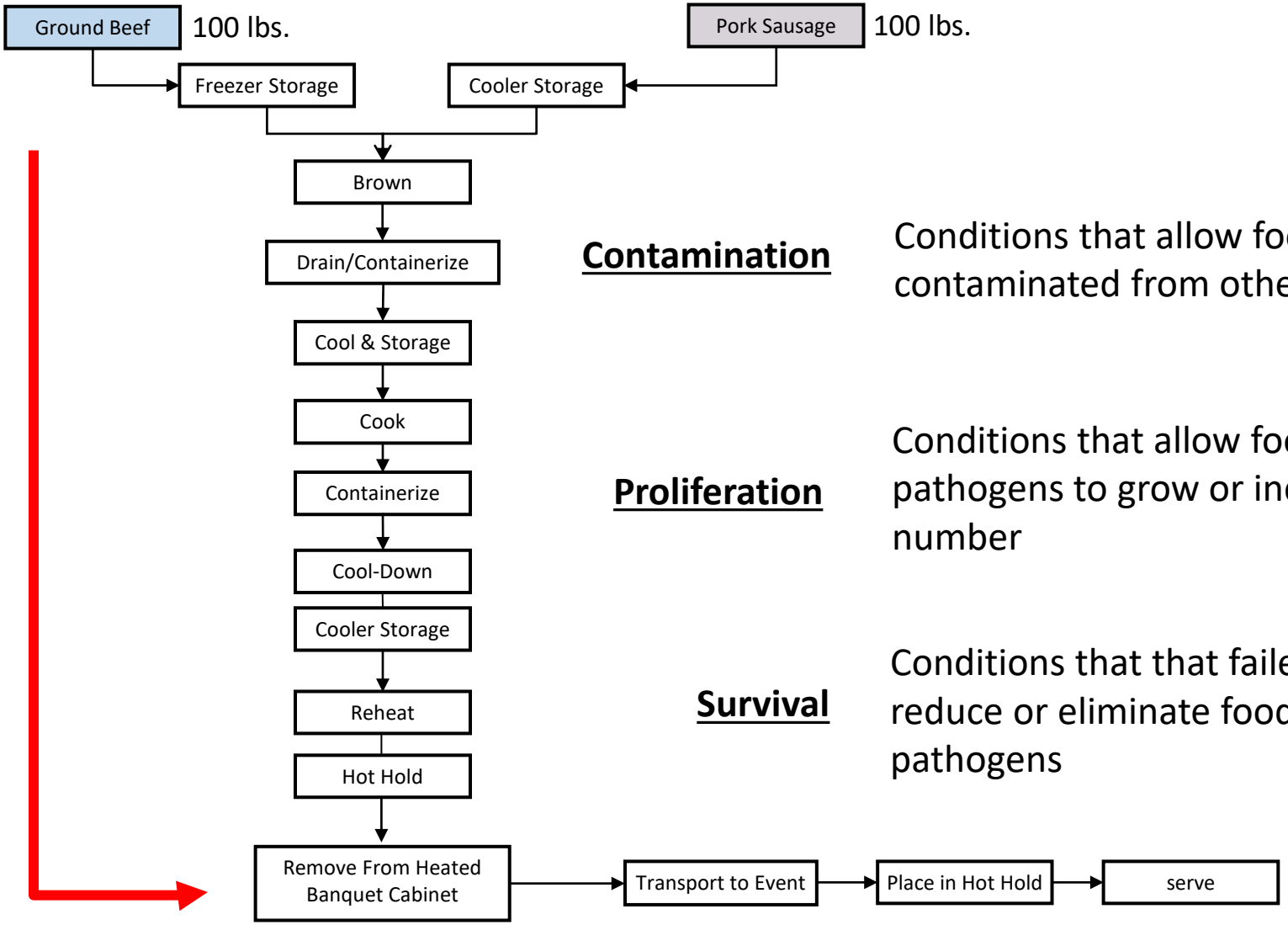
A. Cooking

B. Cooling

C. Hot holding

D. All steps

# Which steps should be investigated? All Steps!




**Contamination**

Conditions that allow foods to be contaminated from other exposures

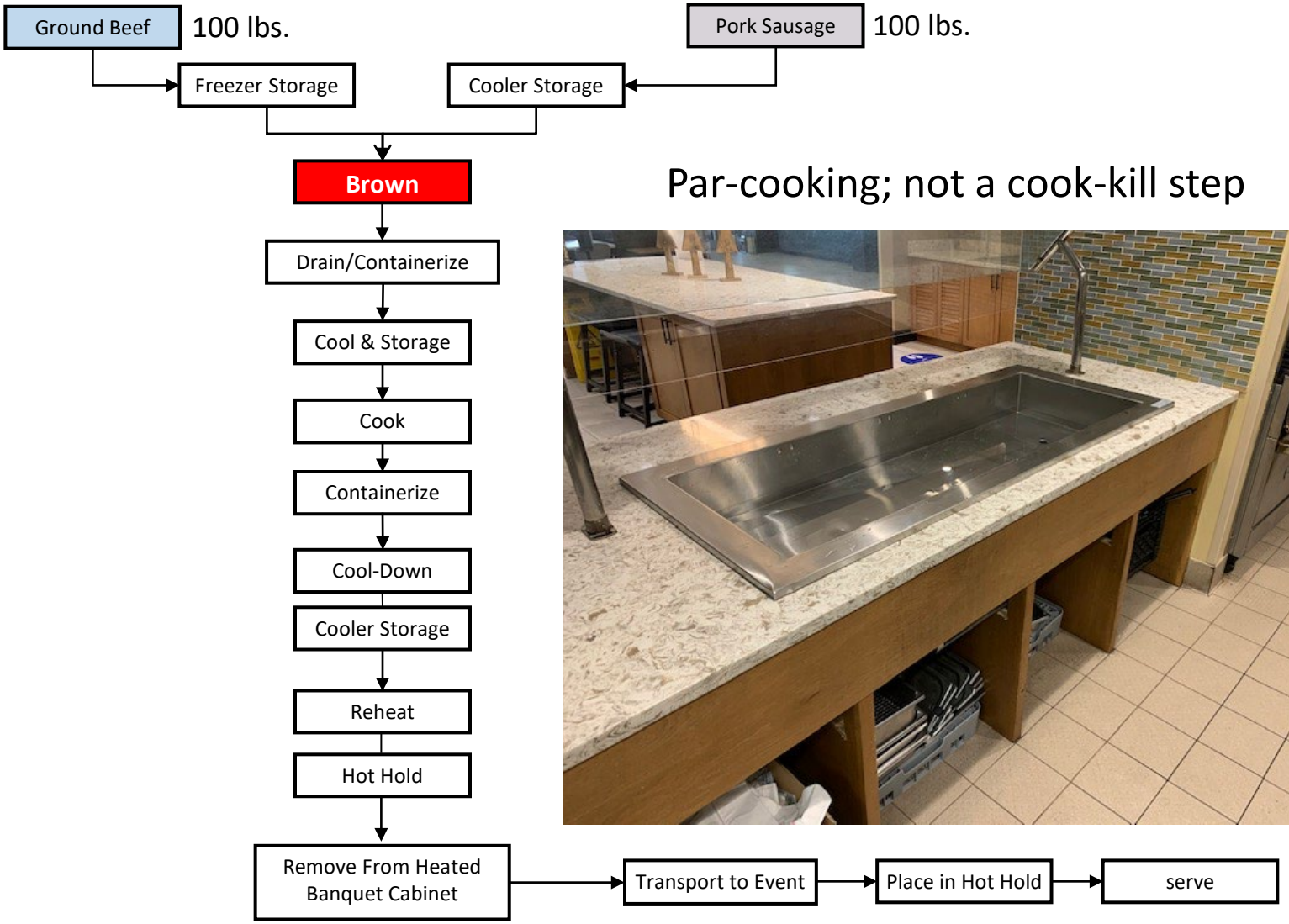
**Proliferation**

Conditions that allow foodborne pathogens to grow or increase in number

**Survival**

Conditions that that failed to reduce or eliminate foodborne pathogens

# Contributing Factors




Par-cooking; not a cook-kill step

# Contributing Factors

Ground Beef 100 lbs.

Pork Sausage 100 lbs.

Freezer Storage

Cooler Storage

Brown

Drain/Containerize

**Cool & Storage**

Cook

Containerize

Cool-Down

Cooler Storage

Reheat

Hot Hold

Remove From Heated Banquet Cabinet → Transport to Event → Place in Hot Hold → serve

Buckets filled to top and covered; walk-in cooler

# Contributing Factors

Ground Beef 100 lbs.

Pork Sausage 100 lbs.

Freezer Storage

Cooler Storage

Brown

Drain/Containerize

Cool & Storage

**Cook**

Containerize

Cool-Down

Cooler Storage

Reheat

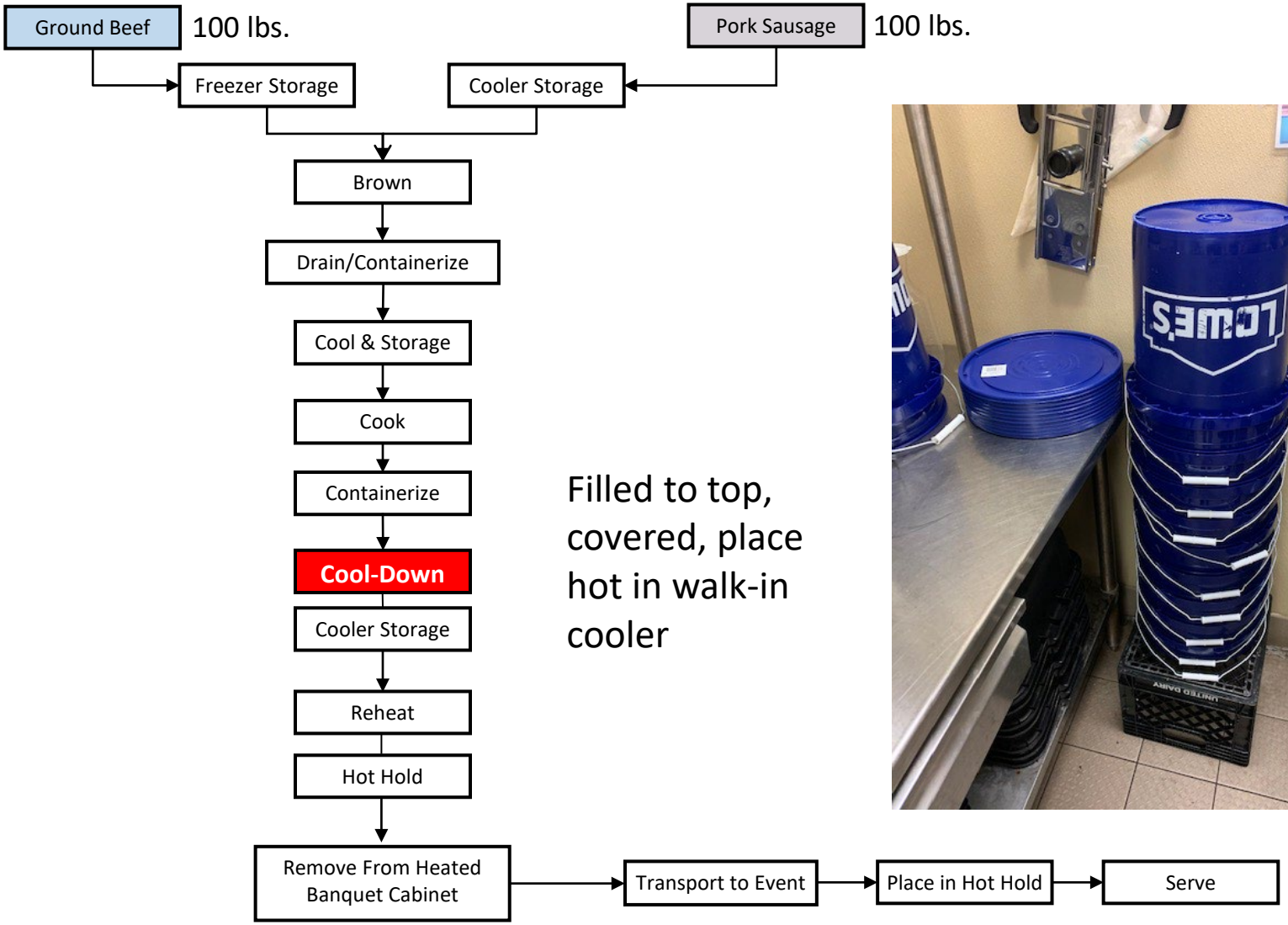
Hot Hold

Remove From Heated Banquet Cabinet → Transport to Event → Place in Hot Hold → serve

Final cook temperature reported at 165° F

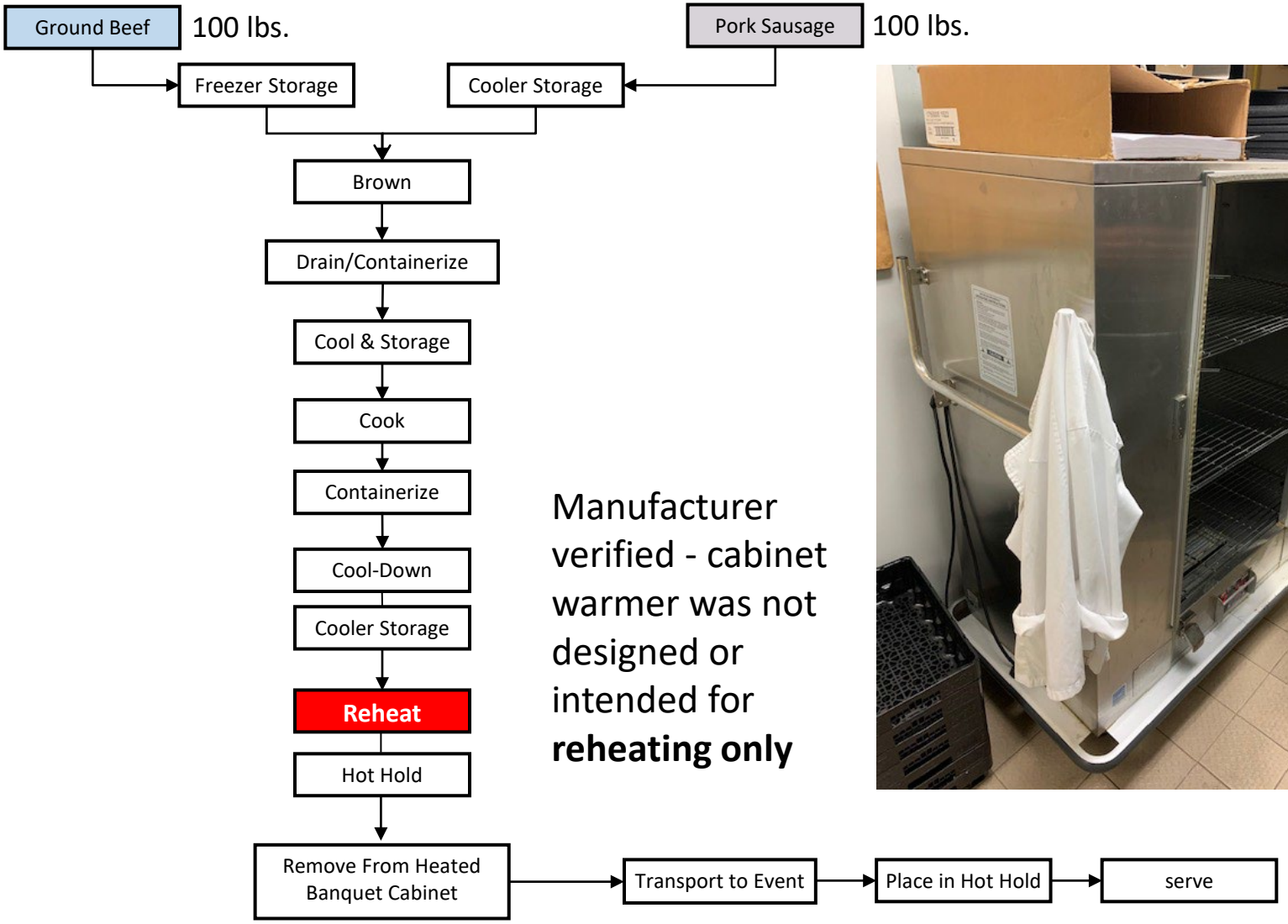
Equipment manufacturer contacted – verified device not designed or intended for cooking

# Contributing Factors



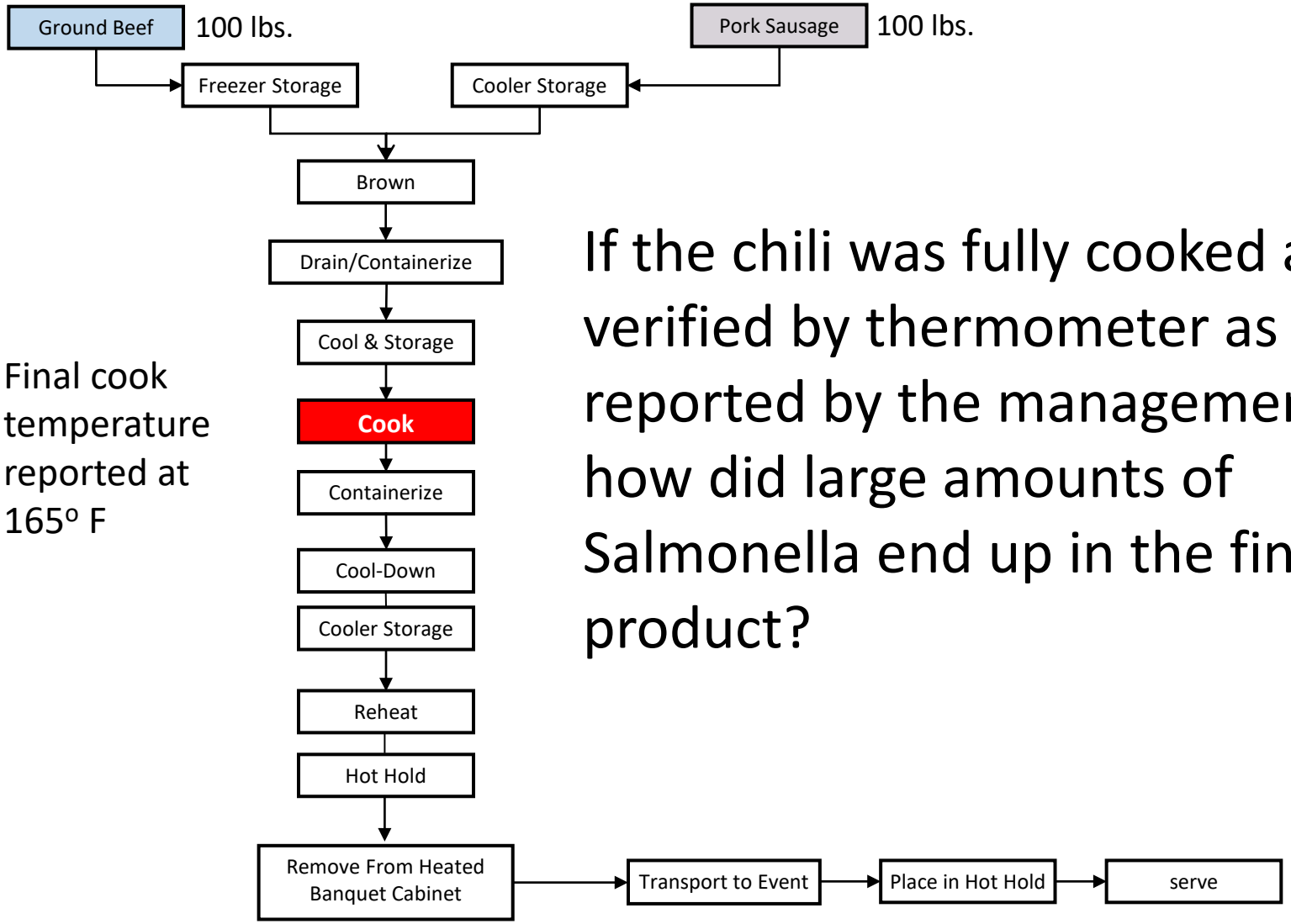

Filled to top, covered, place hot in walk-in cooler

# Contributing Factors




Manufacturer verified - cabinet warmer was not designed or intended for **reheating only**

# Critical Thinking Question




Final cook temperature reported at 165° F

If the chili was fully cooked and verified by thermometer as reported by the management, how did large amounts of Salmonella end up in the final product?

# Stealth Preparation Steps

Ground Beef 100 lbs.

Pork Sausage 100 lbs.

Freezer Storage

Cooler Storage

Brown

**Drain/Containerize**

Cool & Storage

Cook

**Containerize**

Cool-Down

Cooler Storage

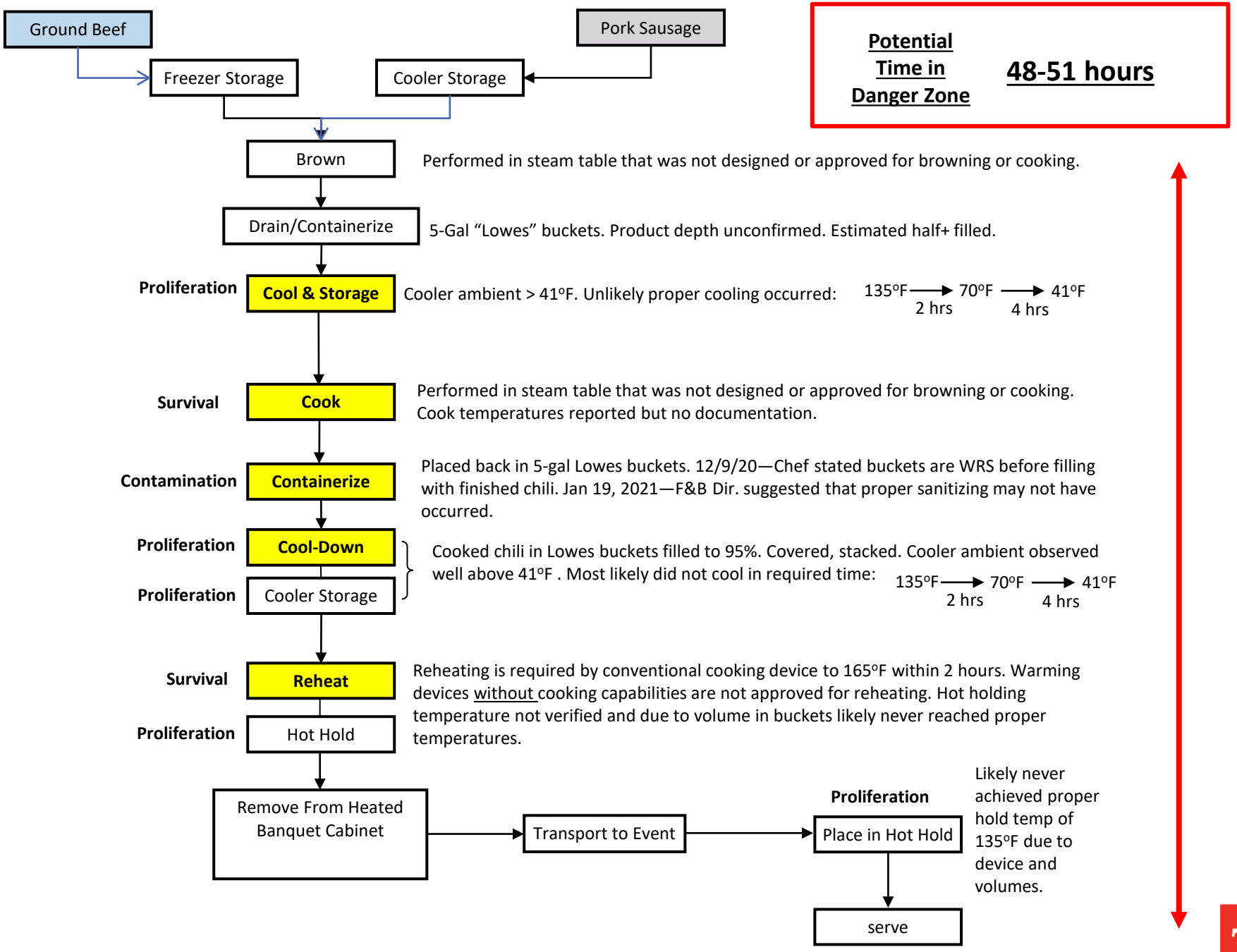
Reheat

Hot Hold

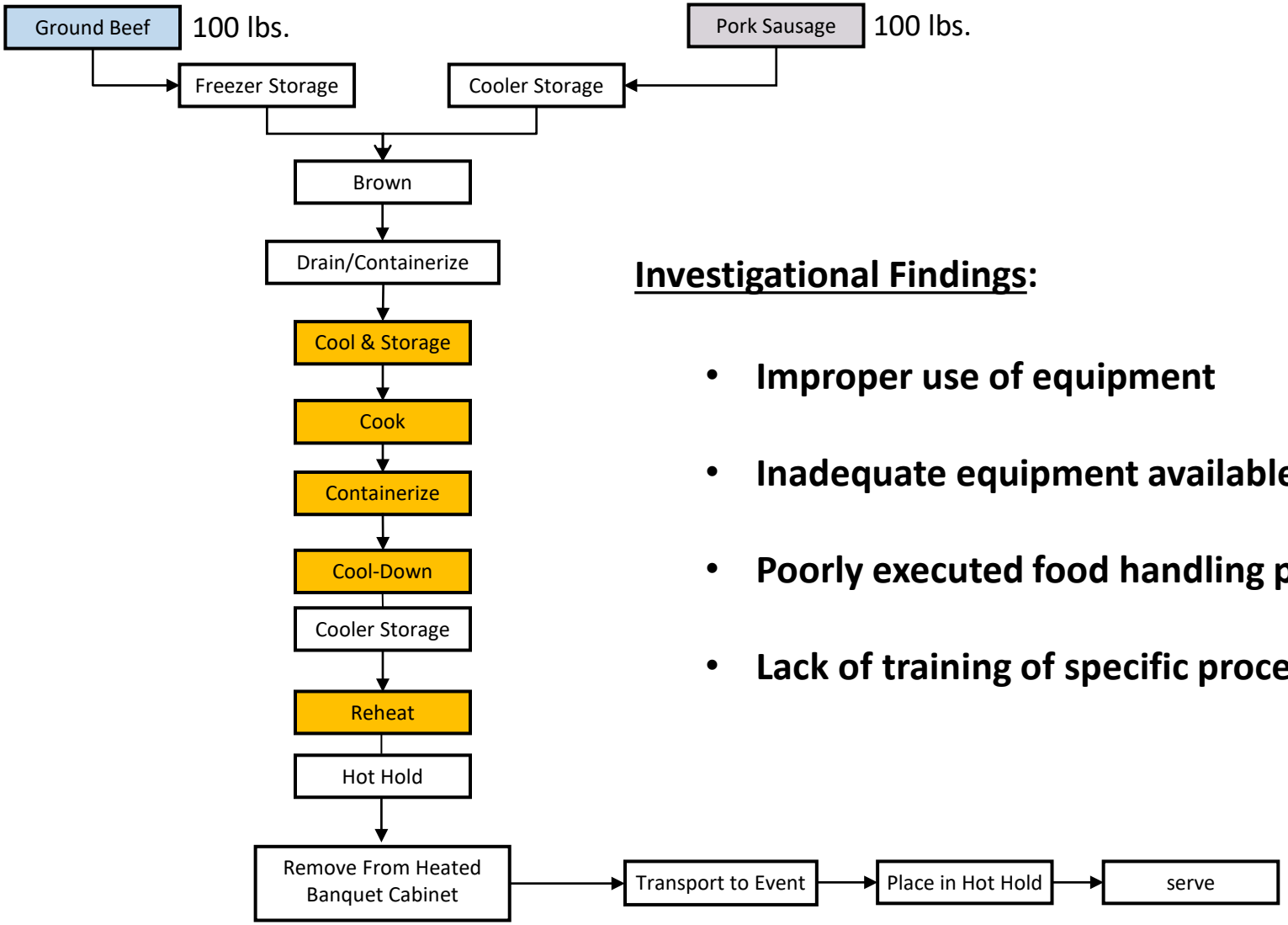
Remove From Heated Banquet Cabinet → Transport to Event → Place in Hot Hold → serve

**Sanitize**

**Jan 19, 2021— F&B Dir. suggested that proper sanitizing may not have occurred.**


Ground Beef
Pork Sausage
Freezer Storage
Cooler Storage
Potential Time in Danger Zone
48-51 hours
Brown
Performed in steam table that was not designed or approved for browning or cooking.
Drain/Containerize
5-Gal "Lowes" buckets. Product depth unconfirmed. Estimated half+ filled.
Proliferation
Cool & Storage
Cooler ambient > 41°F. Unlikely proper cooling occurred:
135°F → 70°F → 41°F
2 hrs
4 hrs
Survival
Cook
Performed in steam table that was not designed or approved for browning or cooking. Cook temperatures reported but no documentation.
Contamination
Containerize
Placed back in 5-gal Lowes buckets. 12/9/20—Chef stated buckets are WRS before filling with finished chili. Jan 19, 2021—F&B Dir. suggested that proper sanitizing may not have occurred.
Proliferation
Cool-Down
Proliferation
Cooler Storage
Cooked chili in Lowes buckets filled to 95%. Covered, stacked. Cooler ambient observed well above 41°F . Most likely did not cool in required time:
135°F → 70°F → 41°F
2 hrs
4 hrs
Survival
Reheat
Proliferation
Hot Hold
Reheating is required by conventional cooking device to 165°F within 2 hours. Warming devices without cooking capabilities are not approved for reheating. Hot holding temperature not verified and due to volume in buckets likely never reached proper temperatures.
Remove From Heated Banquet Cabinet
Transport to Event
Proliferation
Place in Hot Hold
Likely never achieved proper hold temp of 135°F due to device and volumes.
serve

# Why did these contributing factors occur?




**<u>Investigational Findings</u>:**

- **Improper use of equipment**
- **Inadequate equipment available**
- **Poorly executed food handling process**
- **Lack of training of specific processes**

# Poll Question 8

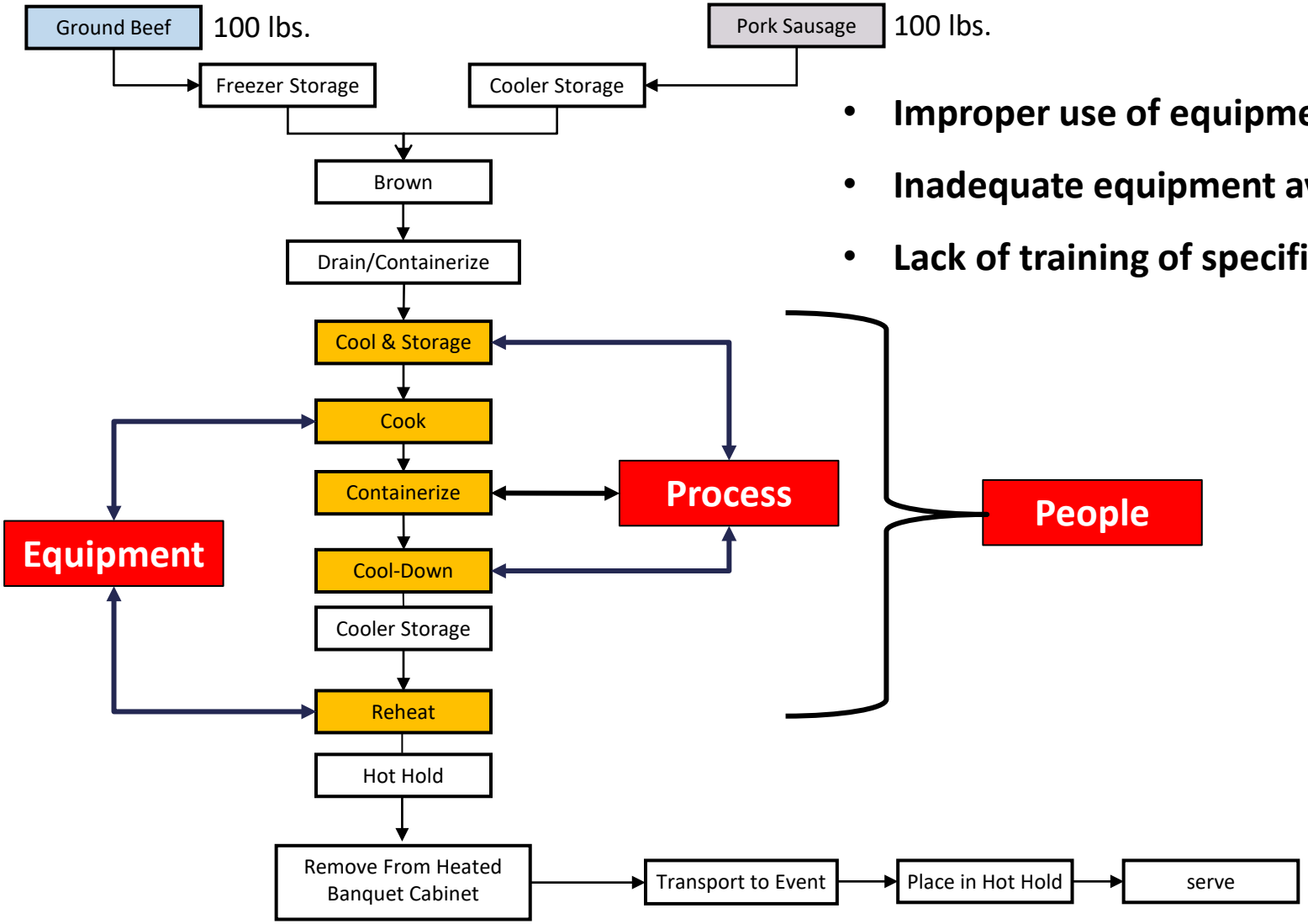
Given:

- ✓ Improper use of equipment
- ✓ Inadequate equipment available
- ✓ Poorly executed food handling processes
- ✓ Lack of training of specific processes

Which environmental antecedents should be reported?

A. Equipment, process
B. Equipment, process, people
C. Equipment, process, people, food
D. Equipment, process, People, food, economics

# Why did these contributing factors occur?




- **Improper use of equipment**
- **Inadequate equipment available**
- **Lack of training of specific processes**

# Food & Environmental Sampling

No leftover chili from Restaurant D

Samples collected from two additional restaurants

Collected 9 environmental samples on December 10


# Lab Analysis

6 clinical isolates

*Salmonella muenchen* positive (0-6 alleles)

Food and Environmental samples were negative

USDA pork sample linked to our isolates

- Isolated September 9, 2020
- Routine USDA FSIS pig intestine sample
- Same firm where 100 lbs. sausage was purchased
- Whole Genome Sequence (WGS) - linked

# Conclusions

528 individuals contacted/300 responded

99 cases and 175 controls (24 States)

4 hospitalizations; 0 deaths

Only Restaurant D's chili was associated
(OR=3.50; 95% CI=1.23-9.94)

Six (6) patient isolates and 1 USDA isolate were *Salmonella* Muenchen positive

WGS-linked (0-6 alleles)

# Conclusions Cont.

Four (4) contributing factors identified
- Survival (inadequate cooking)
- Contamination (use of buckets w/o sanitizing)
- Proliferation (improper cooling)
- Survival (inadequate reheating)

Environmental antecedents identified
- Improper use and type of equipment
- Improper training

Targeted control measures implemented
- Training
- Notices to address proper equipment use

# Thanks!

Acknowledgments:

- TDH Foodborne and Enteric Diseases (FED) Program
- TDH State Public Health Lab Team
- TDH Environmental Health Team
- CDC EHS-Net
- AFDO
- Contact information:  cedep.ehsnet@tn.gov