

***SALMONELLA ENTERICA* SEROTYPE PARATYPHI B
VAR. JAVA GASTROENTERITIS OUTBREAK
ASSOCIATED WITH UNPASTEURIZED TEMPEH —
NORTH CAROLINA, 2012**

Nicole Lee, MPH

North Carolina Division of Public Health

InFORM Conference

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THE OUTBREAK

- **March 30, 2012**
- **8 cases of gastroenteritis**
 - **Restaurant X, County A**
 - **5 *Salmonella* Paratyphi B var. Java**
- **No common food item**
- **No further cases**



THE OUTBREAK

- **April 24, 2012**
- **10 additional cases**
 - ***Salmonella* Paratyphi B var. Java**
 - **County A**
- **15 laboratory confirmed cases**
 - **Identical pulsed field gel electrophoresis (PFGE)**
 - **“Outbreak strain”**

SALMONELLA SPECIES

- ❑ **Second most common causative agents among foodborne outbreaks**
- ❑ **Leading cause of foodborne outbreak-related hospitalizations**

***SALMONELLA* PARATYPHI B VAR. JAVA**

- **Gastroenteritis**
 - **Fever**
 - **Abdominal Pain**
 - **Diarrhea**

- ***Salmonella* Paratyphi B**
 - **Paratyphoid Fever**

- **Distinguished by ability to ferment tartrate**
- **Paratyphi B var. (L)+ tartrate +**

OBJECTIVES

- ❑ **Determine extent of outbreak**
- ❑ **Identify the source**
- ❑ **Implement control measures**

METHODS AND RESULTS

- **Case finding and hypothesis generation**
- **Identification of the vehicle**
- **Identification and trace-back of the source**

CASE FINDING

- **Active Surveillance**
- **Enhanced Passive Reporting**
 - **Media**
 - **Clinician memos**
 - **Health alert networks**

CASE DEFINITION

- **Probable**
 - **Gastroenteritis**
 - **Epidemiologically linked to a confirmed case**

- **Confirmed**
 - ***Salmonella* Paratyphi B var. Java**
 - **Outbreak strain**

- **No time or geographic limits**
- **Novel PFGE pattern**

LABORATORY METHODS

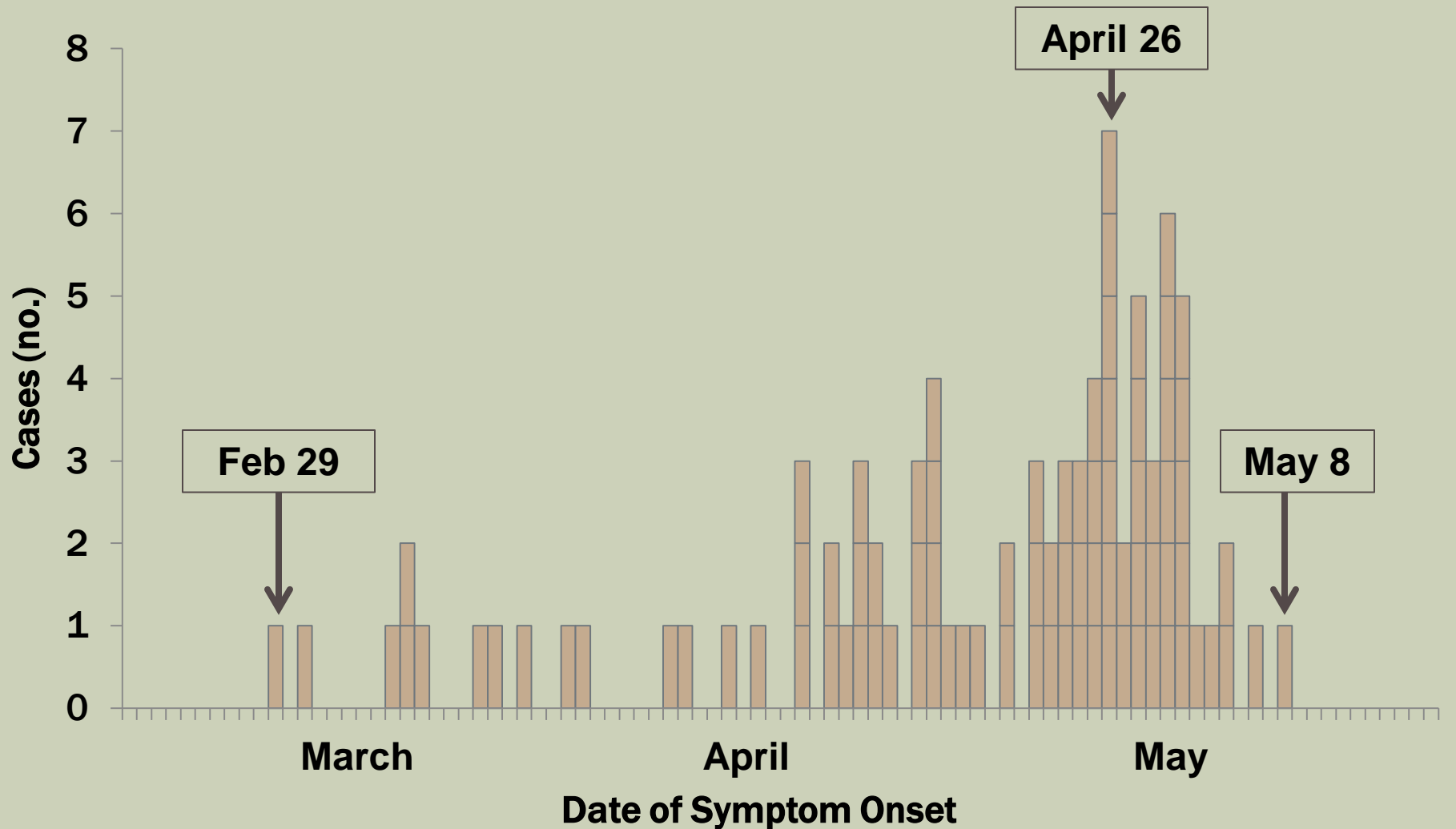
- **Stool culture**
- **Salmonella serotyping**
- **PFGE**

HYPOTHESIS GENERATION

- **Patient interviews**

- **Salmonellosis Reporting Form**
 - **Clinical Symptoms**
 - **Travel History**
 - **Food**
 - **Water**
 - **Animal**

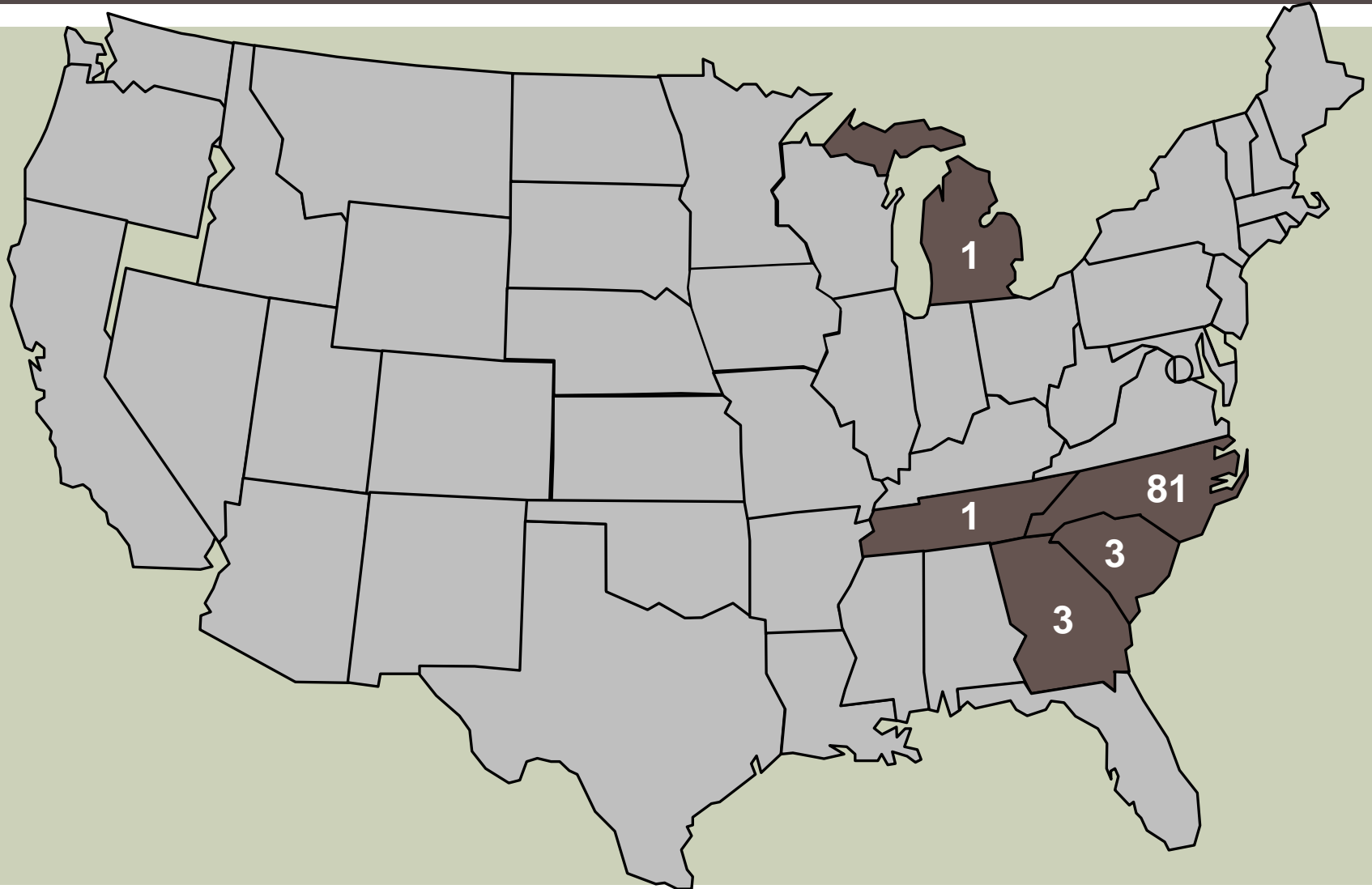
CASES BY DATE OF SYMPTOM ONSET (N=89)



CASE CHARACTERISTICS (N=89)

	No.	%
Confirmed	87	98
Probable	2	2
Female	45	51
Median age, years (range)	24 (4–74)	–
Hospitalized	8	9
Died	0	0

CASE DISTRIBUTION

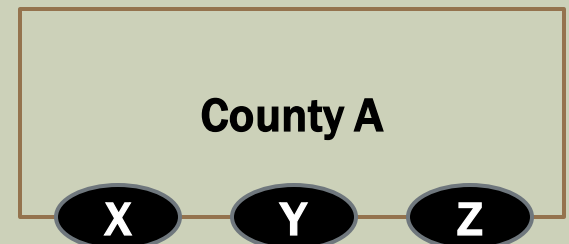


CLINICAL SYMPTOMS (N=89)

Symptoms	Frequency	%
Diarrhea	86/86	100
Abdominal Cramps	70/82	85
Fever	69/84	82
Vomiting	33/84	39
Bloody Diarrhea	30/82	37

COMMON EXPOSURES

- **93% reported travel or residency in County A**
- **No common food, water, animal exposures**
- **Restaurants X, Y, and Z**
- **Vegetarian cuisine**



NC DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

- ❑ **Presumptive positive – *Salmonella***
- ❑ **Tempeh Product**
- ❑ **Produced in County A**

NC DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

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- **Produced in County A**

- **“Brand A Tempeh”**

TEMPEH

- ❑ **Soybeans, seeds, other legumes**
- ❑ **Fermented with mold to produce a firm cake**
- ❑ **Usually pasteurized**
- ❑ **Meat substitute**



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IDENTIFICATION OF THE VEHICLE

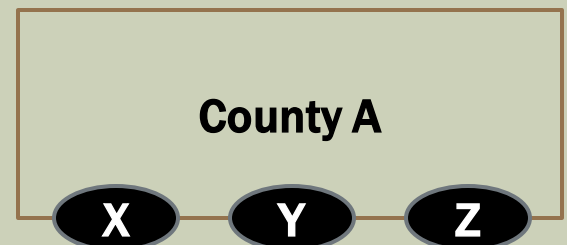
- **Meat substitutes not on standard reporting form**

- **Outbreak-specific questionnaire**
 - **Food history**
 - **Meat substitutes (tempeh, tofu)**
 - **Restaurants in County A**

- **First 50 cases identified**

RESTAURANT SITE VISITS

- **Interviewed staff**
- **Observed food preparation**
- **Collected product invoices**



QUESTIONNAIRE RESULTS

- **Complete interviews on 41/50 cases**
- **82% response rate**

COMMON FOODS (N=41)

Food Item	No.	%
Fresh Fruits	40	98
Fresh Vegetables	38	93
Eggs	32	78
Tofu	21	51
Tempeh	18	44
Veggie Burgers	10	24
Seitan	3	7
Textured Vegetable Protein	3	7

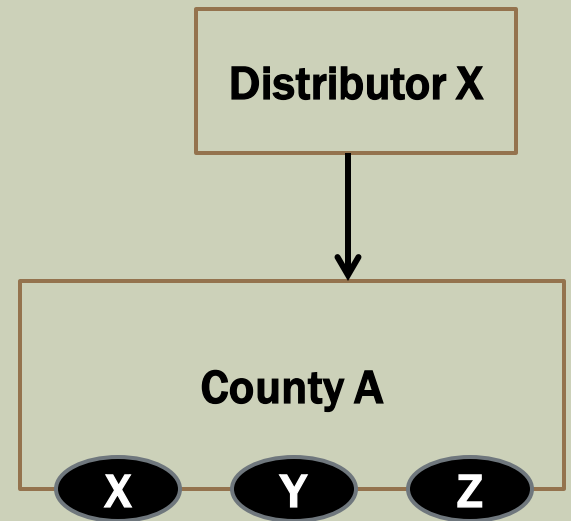
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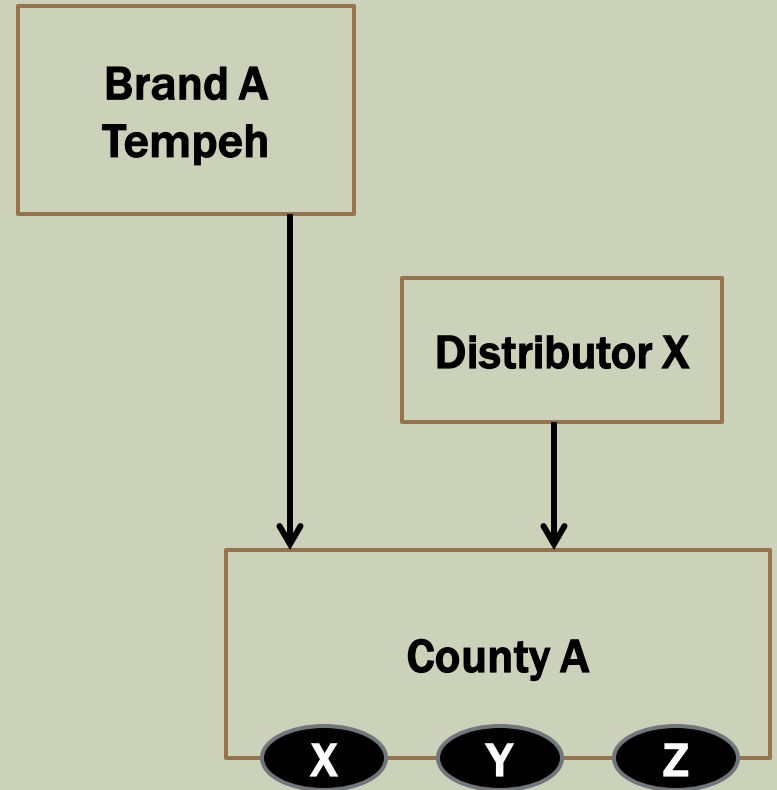
OPPORTUNITIES FOR CROSS CONTAMINATION

- ❑ **Uncooked tempeh prepared on cutting boards with ready to eat (RTE) foods**
- ❑ **Failure to perform hand hygiene after handling uncooked tempeh**
- ❑ **Bare hand contact with RTE foods**

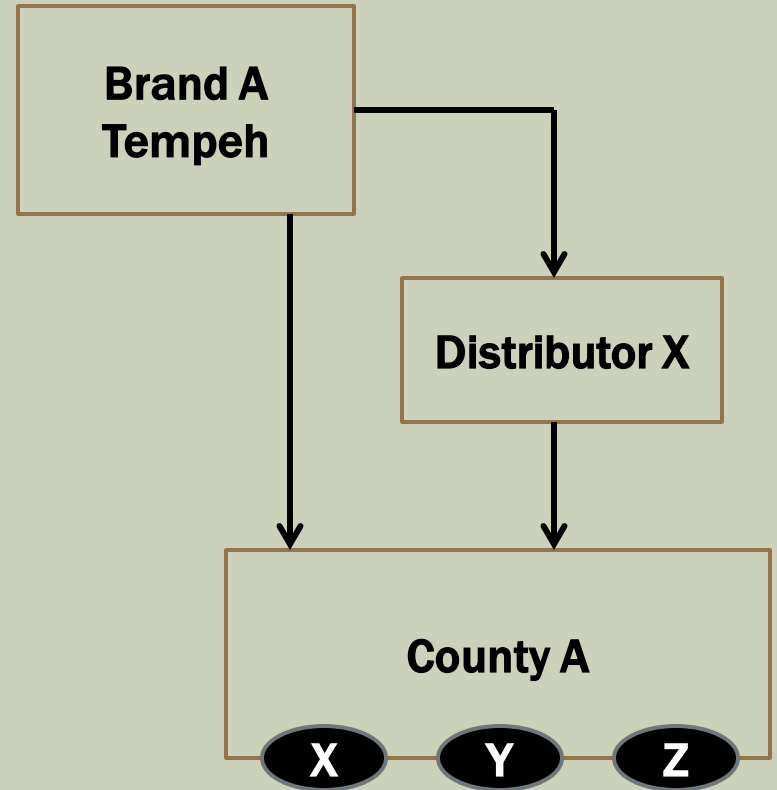
PRODUCT INVOICES



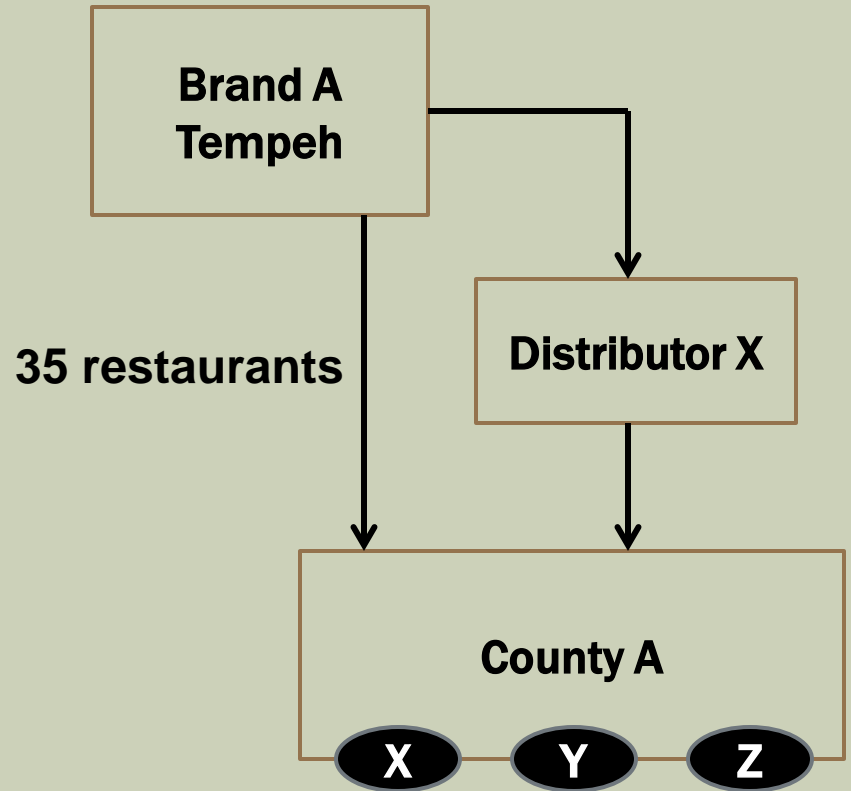
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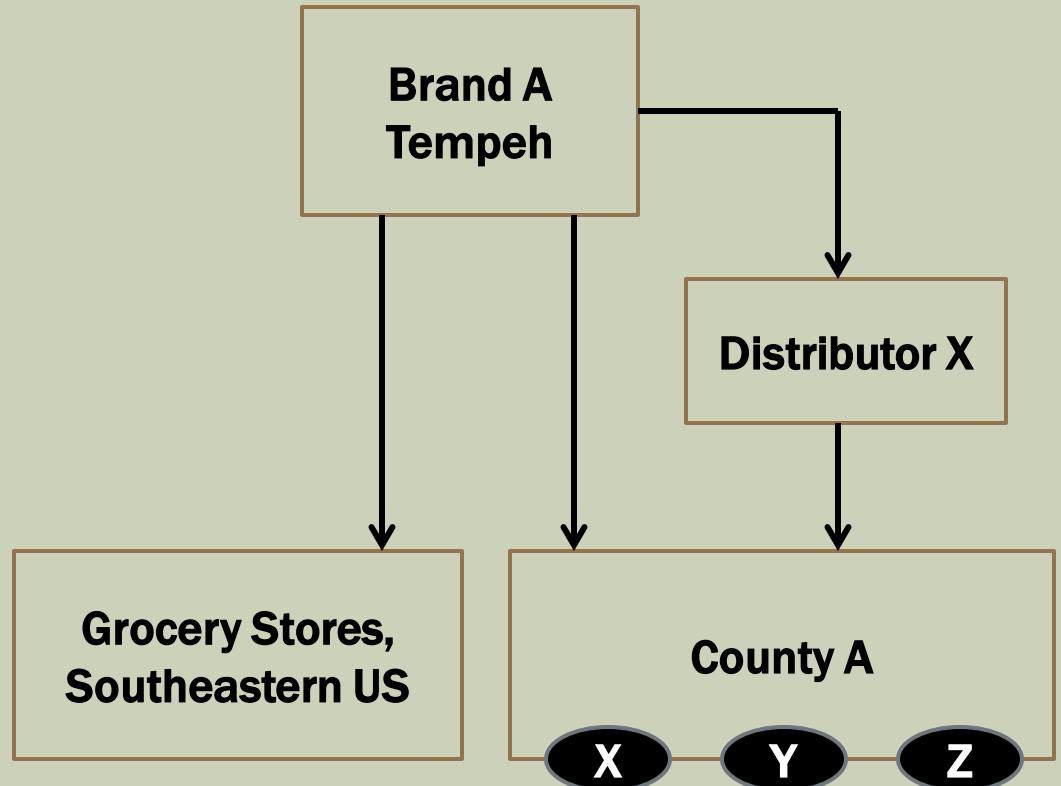
PRODUCT INVOICES



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PRODUCT INVOICES



BRAND A TEMPEH EXPOSURE

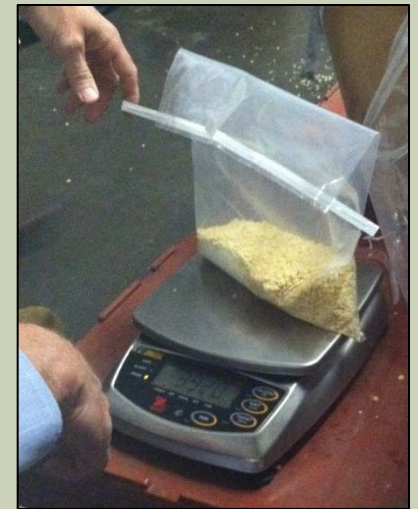
- **Obtained list of distribution sites**
- **100% cases eaten at a restaurant or venue serving Brand A Tempeh**

BRAND A TEMPEH

- ❑ **Operation since 2009**
- ❑ **Shared kitchen in County A**
- ❑ **Not pasteurized**

SHARED KITCHEN

- ❑ Interviewed staff
- ❑ Reviewed production methods
- ❑ Obtained food samples for testing



BRAND A TEMPEH STAFF

- **6 Staff Members**
- **No reported illnesses**
- **No international travel**

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**

+



Vinegar

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**



Vinegar



Rhizopus

+

+

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**



+

Vinegar

+



Rhizopus

→



Tempeh

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**



Vinegar



Rhizopus



Tempeh

**Outbreak
Strain**

+

+

→

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**

Negative

+



Vinegar

+



Rhizopus

→



Tempeh

**Outbreak
Strain**

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**

Negative



Vinegar

Not tested



Rhizopus



Tempeh

**Outbreak
Strain**

TEMPEH PRODUCTION



**Soybeans,
Black Beans, Black-
eyed Peas**

Negative



Vinegar

Not tested



Rhizopus

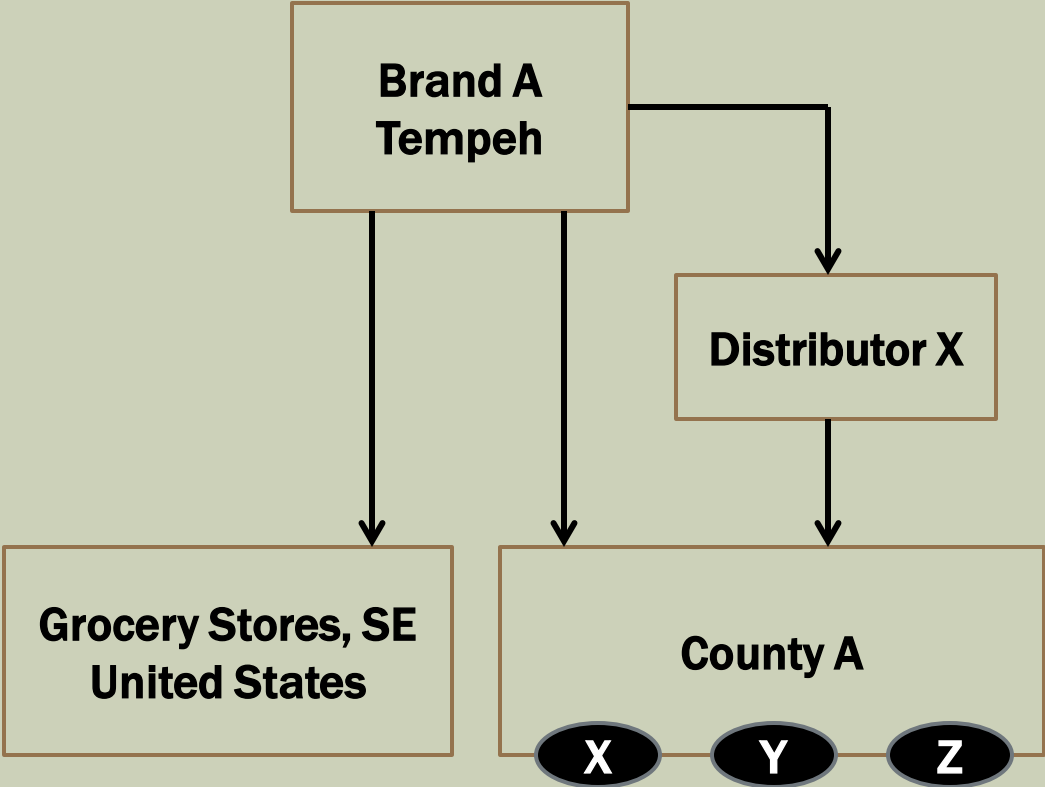
**Outbreak
Strain**



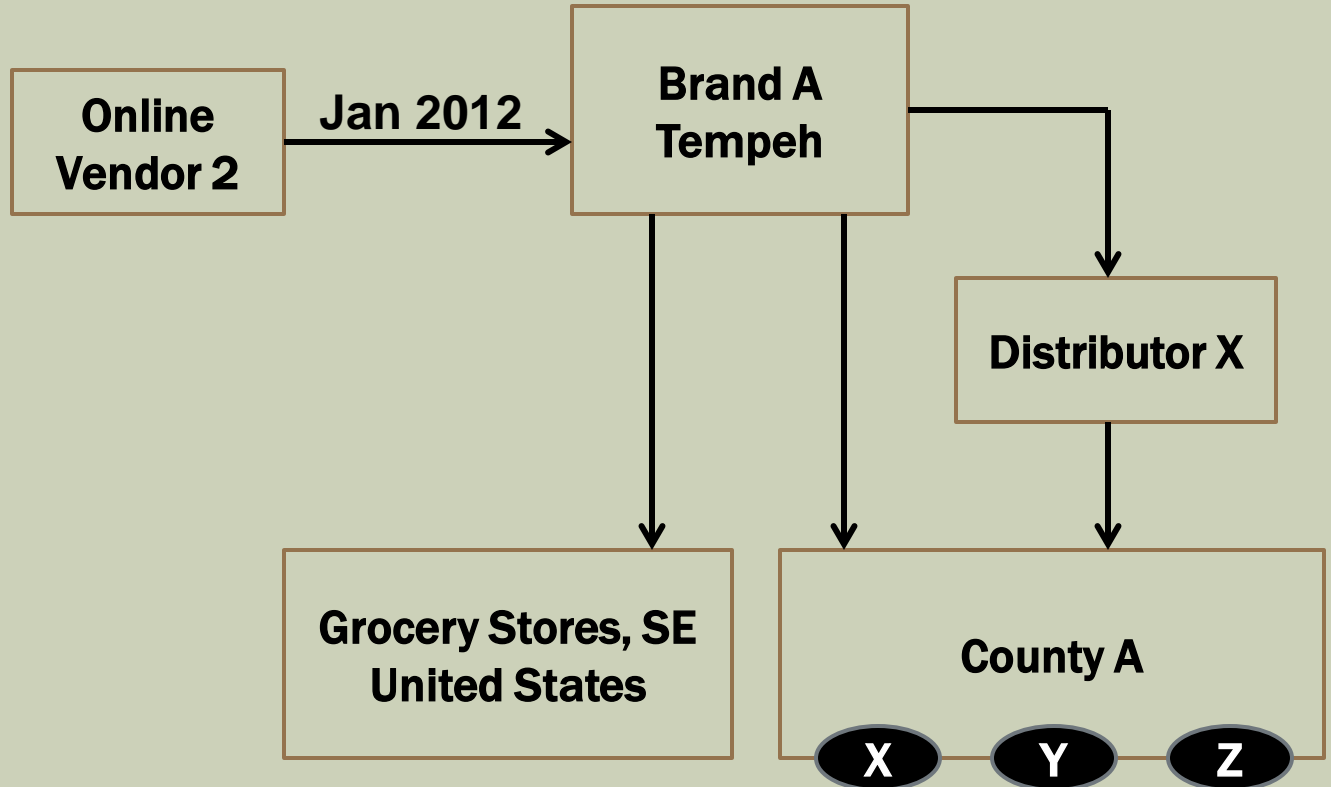
Tempeh

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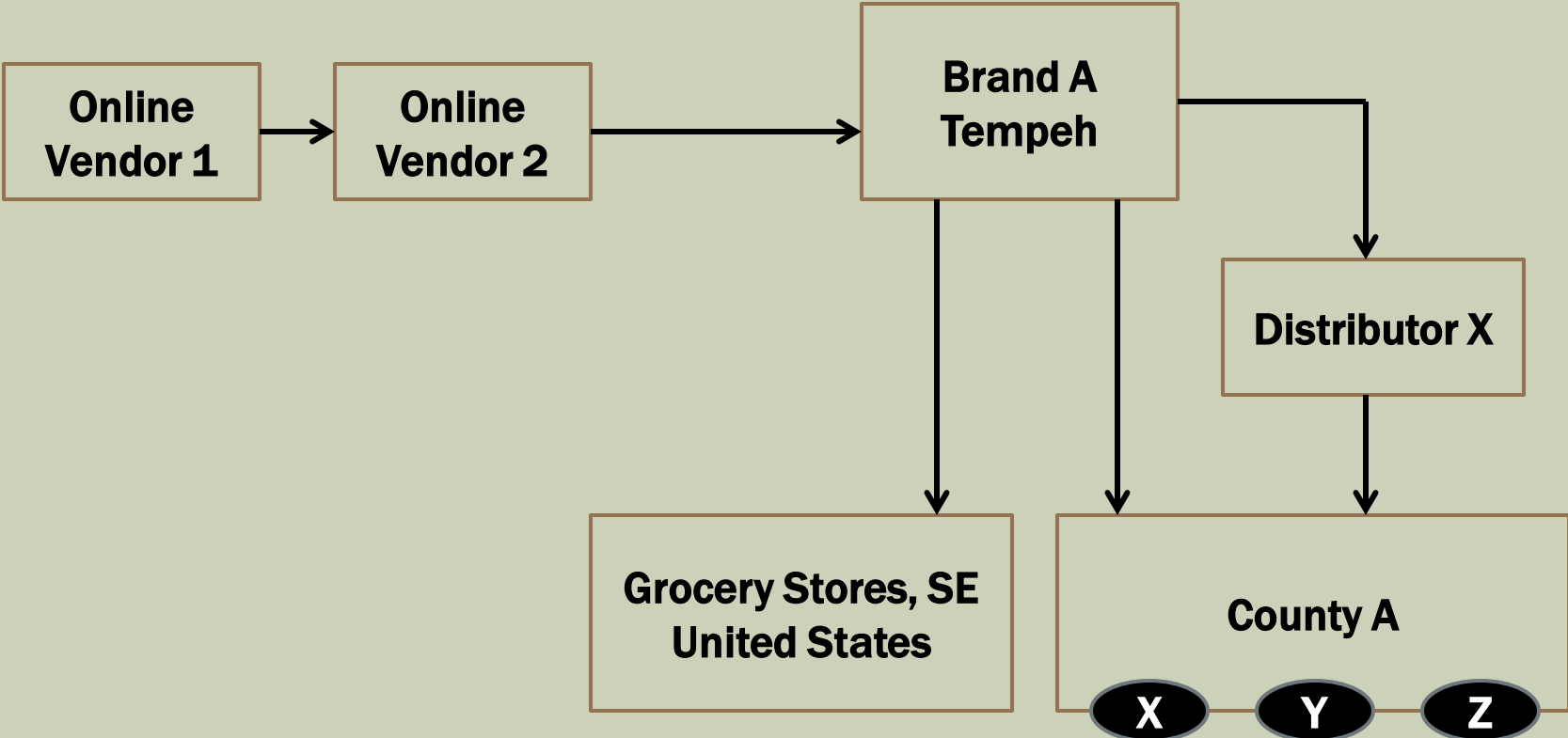
RHIZOPUS TRACE BACK



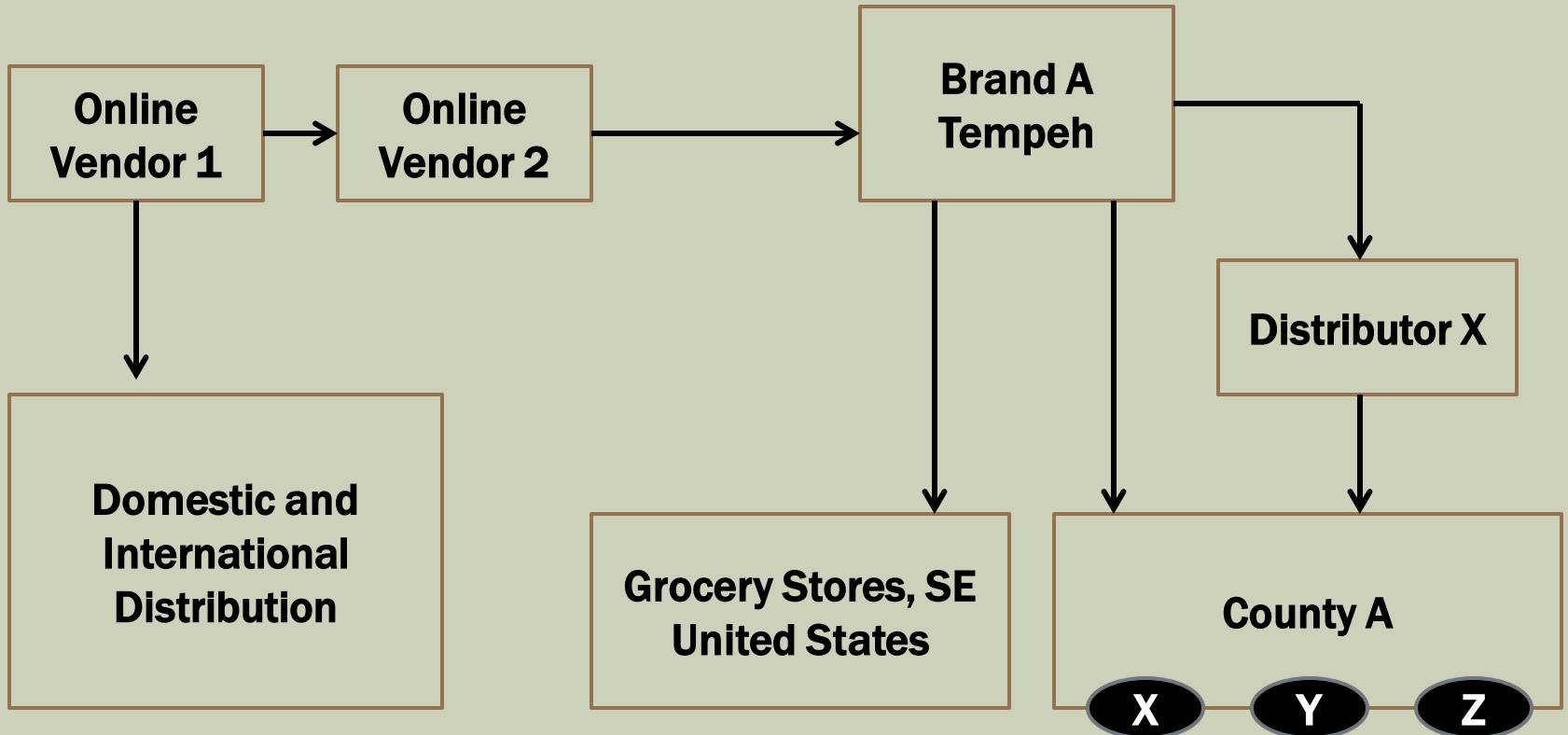
RHIZOPUS TRACE BACK



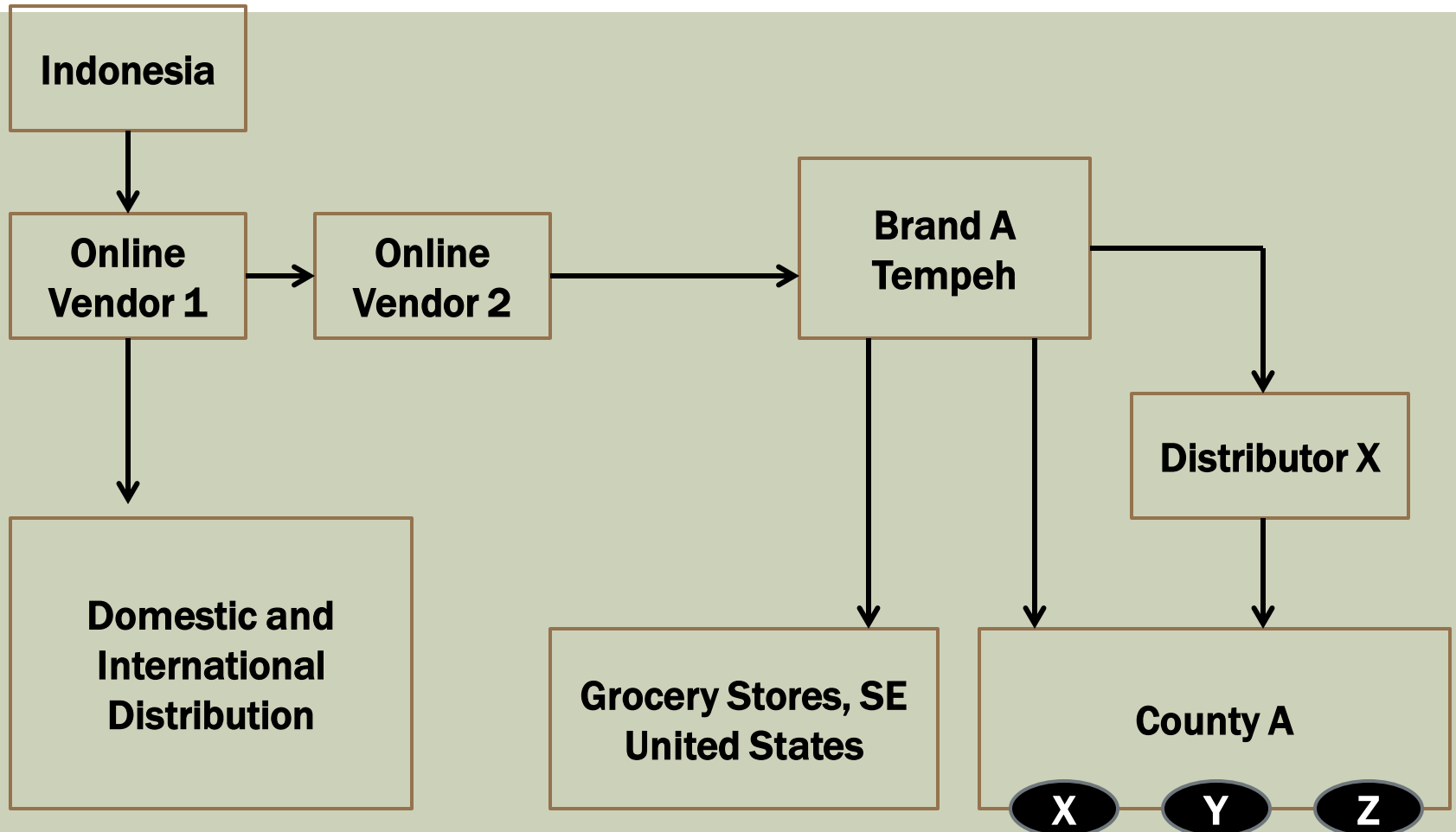
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RHIZOPUS TRACE BACK



RHIZOPUS TRACE BACK



CONCLUSIONS

- ***Rhizopus* culture was the source**
- **Brand A Tempeh was the vehicle**
- **Transmission occurred**
 - **Direct consumption**
 - **Cross-contamination of RTE foods**

LIMITATIONS

- **Targeted first 50 cases for re-interview**
- **Incomplete case finding**

RAW TEMPEH

- ❑ **Fungal growth encouraged**
- ❑ **Favorable conditions for pathogens**
- ❑ **Unpasteurized**
 - **No opportunity to reduce pathogenic load**

RECOMMENDATIONS

- ❑ **Designated cutting boards**
- ❑ **Separation from RTE foods**
- ❑ **Frequent hand hygiene**

PUBLIC HEALTH ACTIONS

- ❑ ***Rhizopus* culture recalled**
- ❑ **Brand A Tempeh recalled**
- ❑ **Education on proper handling of uncooked, unpasteurized tempeh**
- ❑ **Consider pasteurization**

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***Coauthors listed in red.**

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Joan Sims, Janna Spruill, Jim Melvin, Dan Ragan

North Carolina Division of Public Health

Megan Davies
Denise Griffin
Debra Springer
Jean-Marie Maillard
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Thank you