

# **The *Salmonellosis* Outbreak of Spring 2012**

## **Tempeh**

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# What is Tempeh?

It's made from whole soy beans which are softened by soaking. Then they're cooked, slightly fermented and formed into a firm patty or block. And actually, while tempeh is traditionally made with soybeans, it can actually be made with any type of bean, like black beans, black-eyed peas, and chickpeas.

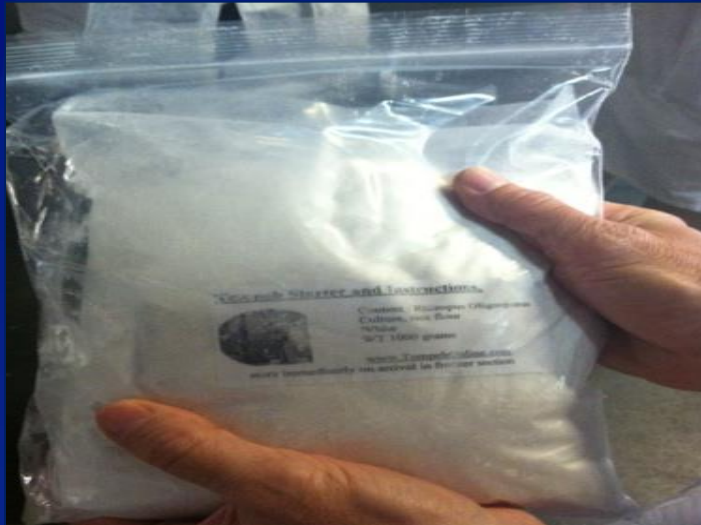
## What does it look like?

- Tempeh's appearance is peculiar; white fluffy mushroom mycelium enwraps the yellow soybeans (or whatever plant-food used) and holds it firmly together thus creating a flexible, bendable, and nicely chewy texture. As it grows, the exposed surface develops some black and grey coloration, which is evidence of the fungus' spores.



# Starter Culture

## *Rhizopus oligosporus*



NORTH CAROLINA DEPARTMENT OF AGRICULTURE  
AND CONSUMER SERVICES  
FOOD AND DRUG PROTECTION DIVISION

Food Inspection Report Cover Sheet  
Continuation Sheet

Firm Name:

04/18/2012

Inspection Date:

**Soybean Tempeh Product Flow**

Soybeans & 5% vinegar and city water are added to 5-gallon bucket and held overnight in walk-in cooler at 31°F.



Hydrated beans are added to steam kettle along with city water and boiled for 45 minutes while skimming and removing floating hulls.



Partially cooked beans flow out of steam kettle into bucket with holes allowing water to drain into floor drain.



The beans are poured on to a clean cloth supported by stainless steel table and fans blow air across the top of the beans. The beans are rotated by plastic scrapers to aid in cooling.



Once the beans reach room temperature, 50 lbs. of the beans are added to the 60 qt Hobart mixer along with 1.5 cups of 5% vinegar, and 45 grams of culture and blended for 5 minutes on speed #1.



12 oz. of beans are placed into a 7" X 8" perforated re-closable plastic bag and placed on a wire mesh tray and placed in a speed cart.



The racks are moved into a room at 86°F for 26-36 hours. The product is then placed into 31°F walk-in cooler until the product reaches 60°F.



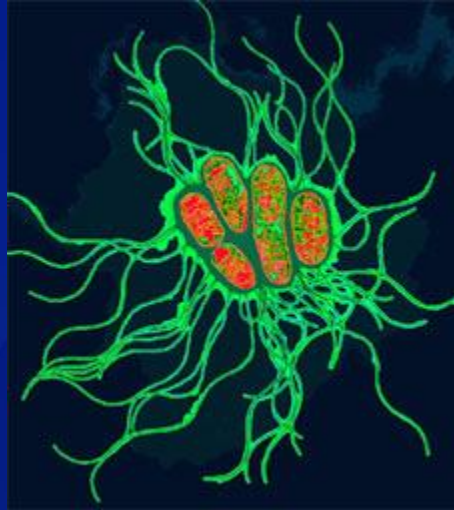
The bags are placed into a (7.5" X 9") cellophane bag which are heat sealed and placed into a walk-in freezer at -10°F overnight.



The next day the bags are labeled and placed into a cardboard case. The product is held and sold frozen. The product is delivered to the customer by the owner.







Growth of ***Salmonella*** species

41.4-50°F (5.2-10°C)

51-70°F (11-21°C)

Above 70°F (21°C)

2 days

5 hours

2 hours

CDC estimates *Salmonella* causes about 1.2 million illnesses, 23,000 hospitalizations, and 450 deaths in the United States every year. Food is the source for about 1 million of these illnesses.

- Most people infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 6 hours to 4 days after infection. The illness usually lasts 4 to 7 days, and most people recover without treatment.
- In some people, the illness may be so severe that the patient needs to be hospitalized.



## **Shared Commercial Kitchen**

- ❑ Provides kitchen space and equipment**
- ❑ Services 60 vendors annually**
- ❑ Actively serving 28 vendors at time of site visit**
  - Caterers**
  - Food trucks**
  - Food carts**
  - Food Manufactures**
- ❑ Vendors responsible for cleaning kitchen space**

# Dry and Wet Kitchens



## Shared Use (Incubator Kitchen)









# The Outbreak

- ❑ March 30, 2012
- ❑ 8 cases of gastroenteritis
  - Restaurant X, Buncombe County
  - 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
  - Buncombe County (Asheville)
- ❑ 15 laboratory confirmed cases
  - Identical pulsed field gel electrophoresis (PFGE)
  - “Outbreak strain”

# Symptoms

One or more of the following:

- ❑ Fever
- ❑ Diarrhea
- ❑ Abdominal cramps
- ❑ Bloody diarrhea

## ***Salmonella* Paratyphi B var. Java**

### **□ Paratyphi B var. (L)+ tartrate +**

This outbreak was caused by *Salmonella* Paratyphi B variant L(+) tartrate(+) bacteria, formerly known as *Salmonella* Java. People with illness caused by this bacteria typically experience diarrhea, fever, and abdominal cramps 12-72 hours after an exposure.

# **NC Department of Agriculture and Consumer Services**

## **Food and Drug Protection Division**

- ❑ **Routine Inspection on 4/18 of Tempeh Manufacturer located in Buncombe County**
- ❑ **Inspection report noted new supplier of culture**
- ❑ **Tempeh Product collected on 4/18**
  - **Presumptive positive (on 4/26) – *Salmonella***
  - **Firm notified – voluntary agreement to withdraw product produced on 4/18**



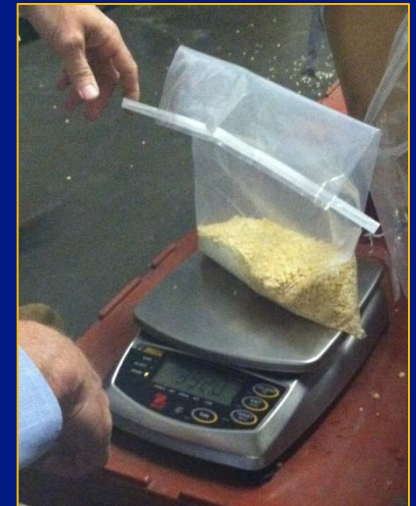
# **NC Department of Agriculture and Consumer Services**

## **Food and Drug Protection Division**

- ❑ **Return to firm on 4/27 to collect:**
  - **Distribution Records**
  - **Samples**
    - 1 - tempeh culture (unopened bag)
    - 1 – tempeh culture (opened bag)
    - 2 – raw beans (black eyed pea, split soybean)
    - 4 – finished product (retail black bean, retail black eyed pea, retail soybean produced 3/12, retail soybean produced 4/25/12)

# Shared Kitchen Site Visit

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



# **NC Department of Agriculture and Consumer Services**

## **Food and Drug Protection Division**

- ❑ Investigation on 4/27**
  - verified product is NOT RTE**
  - tempeh culture purchased from MD online store**
  - owner – contacted retail chain to remove product from sale**
  - distribution records**
  - shared use kitchen closed – plans to conduct environmental swabbing throughout facility**

# NC Department of Agriculture and Consumer Services

## Food and Drug Protection Division

- ❑ **Sample Results on 4/30 – 5/1**
  - 1 - tempeh culture (unopened bag) **Positive**
  - 1 – tempeh culture (opened bag) **Positive**
  - 2 of 4– finished product
    - retail black eyed pea **Positive**
    - retail soybean produced 3/12 **Positive**

# **NC Department of Agriculture and Consumer Services**

## **Food and Drug Protection Division**

- ❑ Recall issued by firm on 5/1**
- ❑ ALL tempeh products with Best By dates 6/11/2011 – 10/25/12**
- ❑ FDA involved**
  - ATL-DO**
  - BAL-DO – investigation into the MD distributor of culture**



**NC Department of Agriculture and  
Consumer Services**  
Food and Drug Protection Division

**May 2**

**Firm had recovered all product from the marketplace  
and destroyed in local landfill**







**CLEAN FORCE**  
POWER WASHER

1800 PSI  
1.6GPM  
Electric Powered  
High Pressure Washer  
Propulsado por electricidad  
Lavadora de alta presión

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Integrated Tip Storage  
Almacenamiento de  
punta integrado

Quick Release Handle  
For Easy Storage



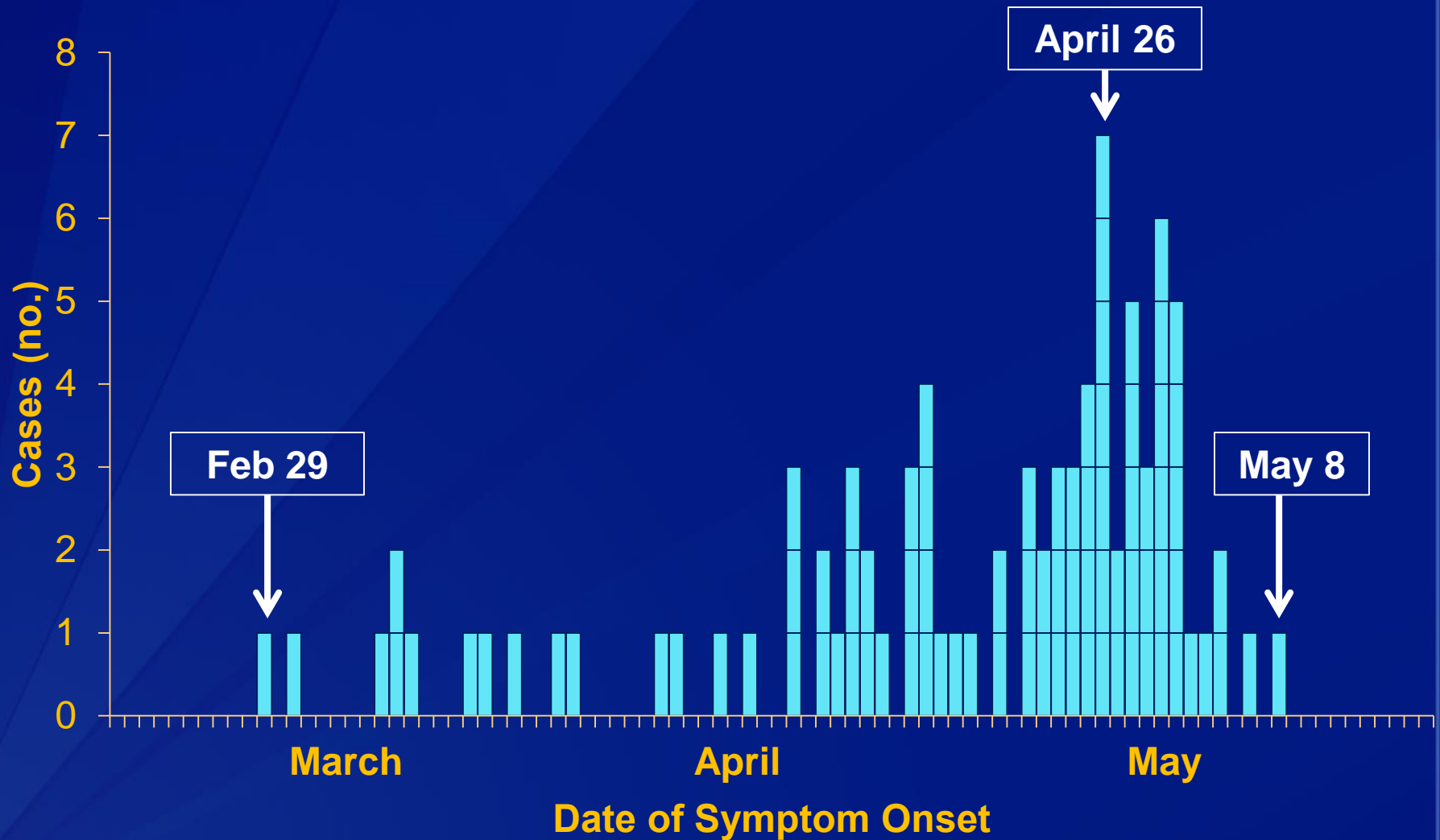




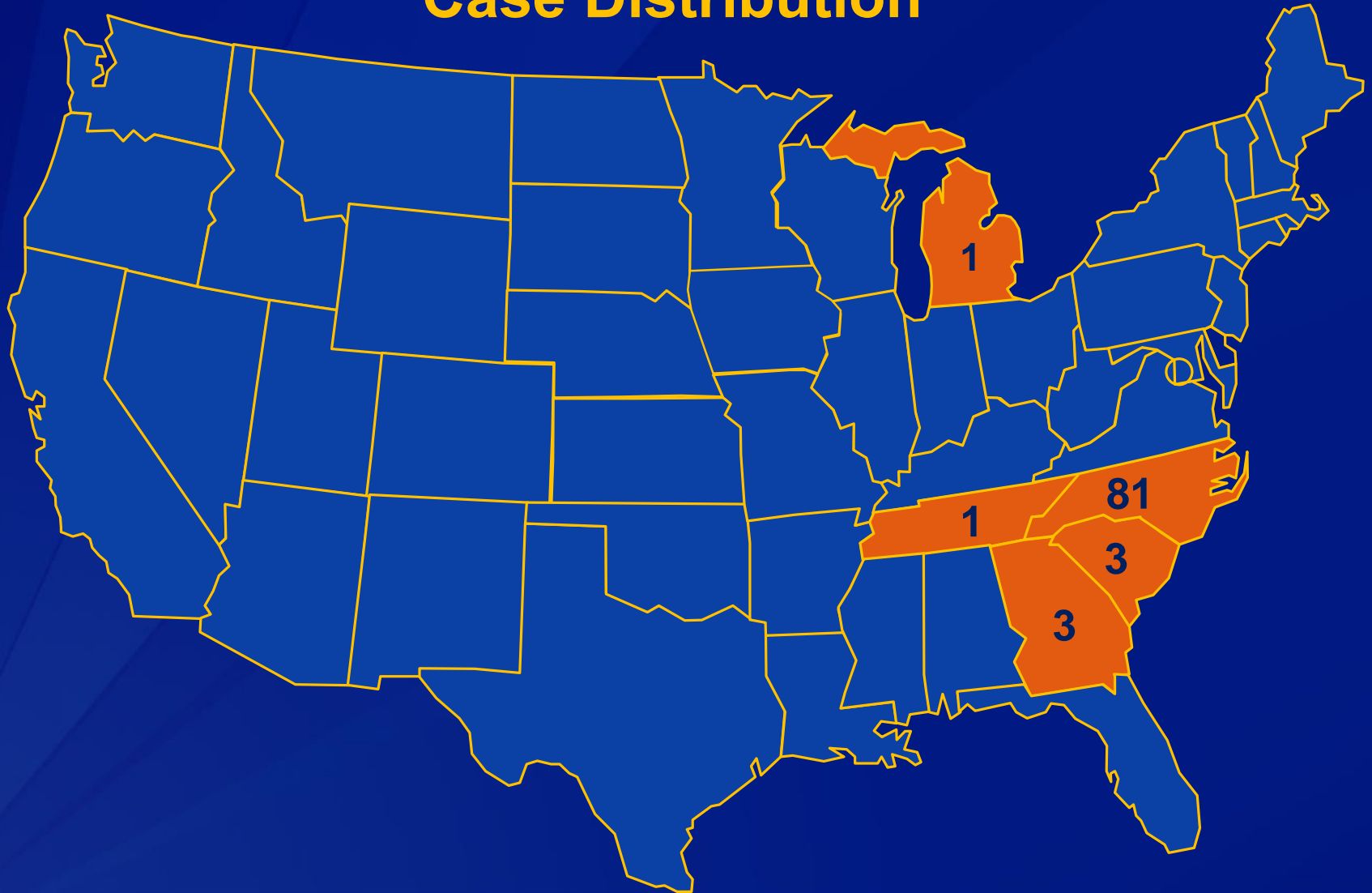




## Cases by Date of Symptom Onset (N=89)



## 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

## Case Characteristics (n=89)

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

## Clinical Laboratory Results

- ❑ 87/89 contributed stool specimens
- ❑ 87/87 *Salmonella* Paratyphi B var Java
  - Outbreak Strain

## Purpose

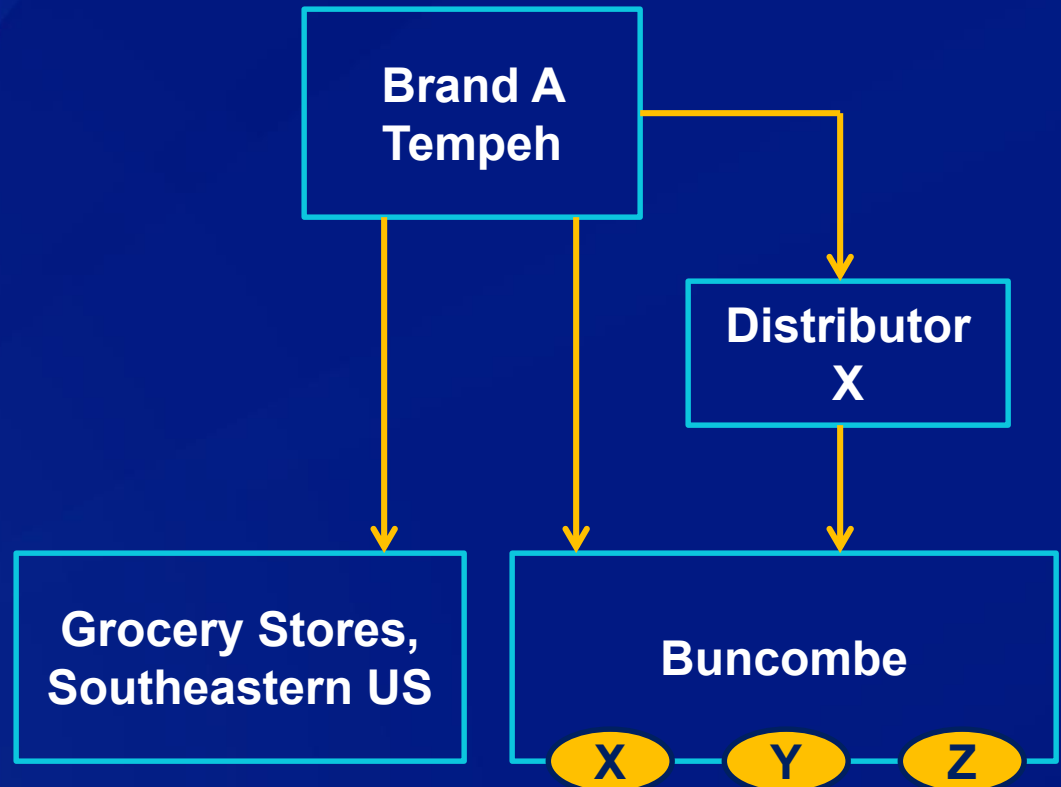
- ❑ *To determine the improper food handling practices that may have contributed to the outbreak*
- ❑ **Assess active managerial control of the top five CDC risk factors for foodborne illness**
  - Improper cooking temperatures
  - Poor employee hygiene
  - Improper holding temperatures
  - Unsafe source
  - Contaminated equipment/surfaces

## **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



## **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 Buncombe**
- ❑ Not pasteurized**

## Environmental Sampling

- ❑ 100 environmental swabs (*Salmonella*)
  - Shared kitchens
  - Chill room
  - Walk-in cooler
- ❑ All swabs negative for *Salmonella*

# 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***

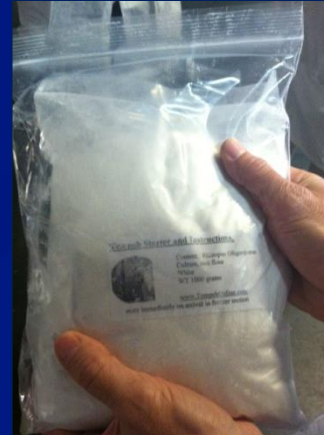
# Tempeh Production



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



**Vinegar**



***Rhizopus***



**Tempeh**

**+**

**+**

**→**

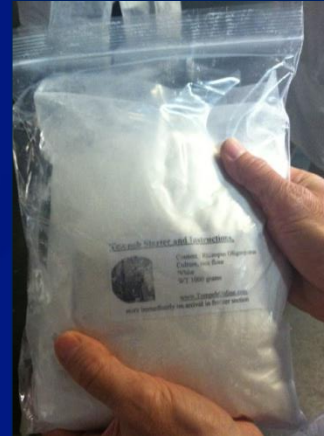
# Tempeh Production



**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



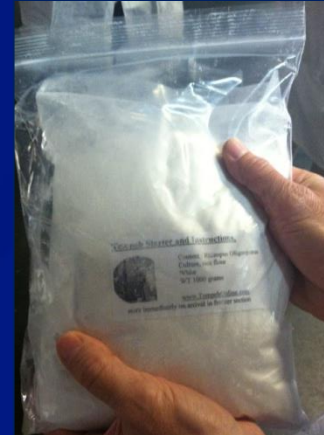
**Soybeans,  
Black Beans,  
Black-eyed Peas**

**Negative**



**Vinegar**

**Not tested**



***Rhizopus***

**Outbreak  
Strain**



**Tempeh**

**Outbreak  
Strain**

**+**

**+**

**→**



## Conclusions

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

## 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

## **March 2013**

- ❑ Affixed warning label**
- ❑ Hired food safety and sanitation coordinator**
- ❑ Instituted a Hazard Analysis Critical Control Points model**
- ❑ Utilized new starter culture company**

## Brand A Tempeh – New Label

ONCE [REDACTED] TEMPEH IS THAWED, KEEP REFRIGERATED AND COOK WITHIN 5 DAYS. DO NOT EAT TEMPEH RAW.

This is a raw food and is intended to be cooked to an internal temperature of 165° F for a minimum of 15 seconds. Our tempeh is a living food meaning it is nutrient dense, but it also means that you need to use safe handling methods by washing hands, surfaces, knives and cutting boards with soap and hot water before and after they have come in contact with raw tempeh.

A simple way to prepare this is to cut into thin strips or chunks (1/4-1/2") and pan fry in a little oil for 5 minutes on each side on medium to medium high heat or until brown. Toss in soy sauce and enjoy!

Visit [REDACTED] for more recipes.



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# Questions?

