

Simulated Foodborne Outbreak

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Disease Control and Prevention*

*An Office of the
Department of Health and Human Services*



Outline

- Outbreak Investigation
 - Environmental Investigation
 - Health Inspection Program (HIP)
 - Department of Marine Resources (DMR)
 - Epidemiological Investigation
 - Maine CDC Infectious Disease Program (EPI)
 - Laboratory Investigation
 - Maine Health and Environmental Testing Laboratory (HETL)

Foodborne Illness Complaint

- On Monday August 12 at 10am Health Inspection Program (HIP) receives an alleged foodborne illness complaint
- 42 year old male
- Symptoms of vomiting and diarrhea
- Onset Sunday August 11 at 9 AM
- No doctor visit

Foodborne Illness Complaint

- Implicated Facility - Chez Angelique Oyster Bar in Benson's Harbor
- Date of meal: Approximately 3 PM Saturday, August 10.
- Two other individuals in their group also mentioned feeling ill last evening

Foodborne Illness Complaint

- Foodborne Illness Complaint Intake
- Referral to Maine CDC Infectious Disease
- Focus environmental investigation on employee health, refrigeration temperatures, and possible cross contamination issues

EPI actions

- EPI and HIP collect initial information from complainant
- Information may include:
 - How many were ill?
 - Other events these people may have attended together?
 - Symptoms?
 - Duration?
 - Anything unusual?
 - Did anyone present to a medical provider?
 - Any specimens collected?
 - Anyone sick before the event?

Foodborne Illness Complaint

- Complainant is organizer of the class reunion event
- Total number at pre-social event ~ 25
- Total number who attended reunion dinner ~ 75

Outbreak team is formed

- May involve a number of different agencies:
 - Maine Center for Disease Control and Prevention (ME CDC)
 - Health Inspection Program
 - Drinking Water Program
 - Medical Epidemiology
 - Infectious Disease
 - Health and Environmental Testing Laboratory
 - Maine Department of Agriculture, Conservation and Forestry
 - Quality Assurance and Regulations
 - Animal and Plant Health
 - Maine Department of Marine Resources
 - Maine Department of Education
 - University of Maine Cooperative Extension
 - Others as applicable (US CDC, FDA, USDA, Northern New England Poison Center, etc.)

Outbreak team communication and documentation

Outbreak Activity Tracking/SitStat Report # 1
(OATS Report: Situation Status, Incident Action Plan, Unit Log)
CONFIDENTIAL/ID EPI PROGRAM USE ONLY

Outbreak Name: _____ Report Date: _____
Outbreak Number: _____ Report Time: _____
Agent/Syndrome/Symptoms: _____ Lead Epi: _____

Operational Period: __/__/__ @ :__ to __/__/__ @ :__	
Situation Summary:	
<ul style="list-style-type: none"> • Summary bullets • Objective of investigation: • Case definition: 	
Unit Personnel:	
<ul style="list-style-type: none"> • Surveillance Epi(s): • Field Epi(s): • Support Epi(s): • External Communications (PIO): • Med Epi: • ID Epi Prog. Manager: • Lab Investigators: • HIP: • DACF: • Federal Agencies: • Other : 	
Incident Action Plan	Point Of Contact
1. Epidemiologic Investigation	
•	
2. Environmental Investigation	
•	
3. Laboratory Investigation	
•	
4. Communications	
•	
5. Other	
• Documentation	
• S: drive pathway for this cluster or outbreak: S:\DiseaseSurveillance\Outbreaks\Investigations_reports	
• Finance	
6. Next Outbreak Team Meeting:	

Recorded By: _____

- Outbreak Sit Stat Reports

EPI attempts to call all of the attendees

- Receives a line list from complainant/organizer as well as a list of food/drinks consumed
- EPI creates a survey
- EPI attempts to call the attendees (even those not sick) to try to determine the cause of the illness
- Usually several epidemiologists involved at this point

GI Outbreak Environmental Assessment

- HIP conducts a joint inspection with the Department of Marine Resources (DMR)
- Interview Person in Charge (PIC)
- Inspector learns the Executive Chef and Cook called out sick
- Inspector relays this information to the investigating epidemiologists

EPI information gathered so far

- These employees are interviewed by epis.
- Confirms that two employees ill.
 - Executive chef submitted specimens at the hospital. Confirms that he sampled the shucked oysters a day before. Epi ensures that specimens are sent to HETL.
 - The cook never presented to a provider and refuses to do so or submit a specimen.
- No other known ill employees.

GI Outbreak HIP Environmental Assessment

- All refrigeration units were functioning properly.
- One case of lemons stored uncovered beneath a box of raw oysters.
- One box of lettuce stored beneath a case of thawing hamburger patties.
- One case of raw chicken wings stored immediately adjacent to steak tips marinating in a covered plastic tote.

GI Outbreak HIP Environmental Assessment

- Cross-contamination issue?
- Contributing factor?

EPI Investigation

- EPI finds out that the following was served at the pre-social to the reunion dinner only:
- Platter #1 contained Steamed Mussels in a Garlic Herb Butter sauce.
- SUSPECT - Platter #2 contained 2 dozen Deep Fried Shucked Oysters.
- SUSPECT - Platter #3 contained a Raw Oyster Sampler of 48 oysters on the half shell.

Question Slide

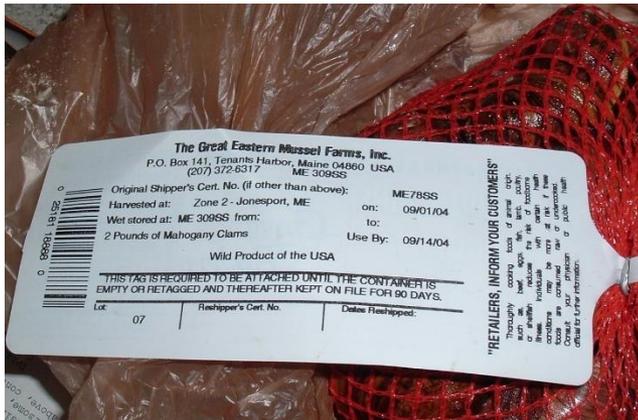
- How many people think we should focus on the steamed mussels?

GI Outbreak Environmental Assessment

- Inspectors share findings of their inspection.
- Epidemiology requests focus on the source and condition of the oysters used in the facility.
- Sous Chef provides Shellfish Harvesters Tags retained over the past 10 days for all oysters served.
- Inspectors photograph each Shellfish Harvesters Tag associated with oysters for future reference.
- All oysters on hand were maintained at 37 to 39 degrees and appeared to be in good condition.
- DMR puts a HOLD on all remaining oysters and takes a sample from each lot for testing at HETL.

Shellfish Tags

- Harvesters required to tag product
- Dealers required to tag product



HARVESTER TAG

NAME _____ DMR LICENSE #: _____

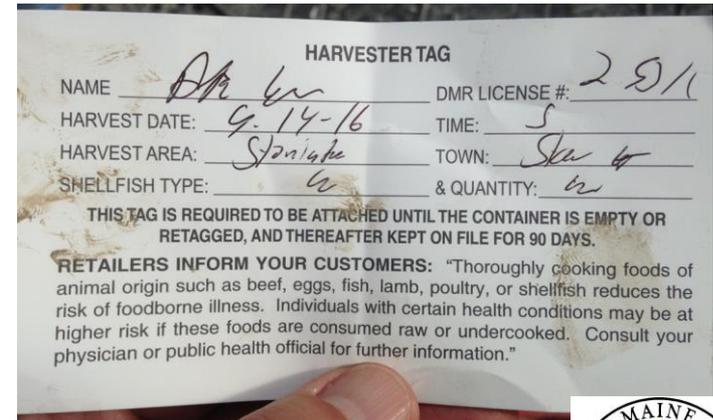
HARVEST DATE: _____ TIME: _____

HARVEST AREA: _____ TOWN: _____

SHELLFISH TYPE: _____ & QUANTITY: _____

THIS TAG IS REQUIRED TO BE ATTACHED UNTIL THE CONTAINER IS EMPTY OR RETAGGED, AND THEREAFTER KEPT ON FILE FOR 90 DAYS.

RETAILERS INFORM YOUR CUSTOMERS: "Thoroughly cooking foods of animal origin such as beef, eggs, fish, lamb, poultry, or shellfish reduces the risk of foodborne illness. Individuals with certain health conditions may be at higher risk if these foods are consumed raw or undercooked. Consult your physician or public health official for further information."



HACCP ANALYSIS FOR FOODBORNE ILLNESS INVESTIGATIONS

INSPECTOR WORKSHEET FOR SUSPECTED FOOD ANALYSIS

Inspector Robert Smith

Establishment – Chez Angelique

Date of Investigation - 8/12/2018 Date of Implicated Meal - 8/10/2018

SOURCE	FOOD	FOOD	FOOD
PRODUCT NAME	Deep Fried Oysters	Raw Oyster Sampler	Raw Oyster Sampler
BRAND NAME	Blue Cove Oysters	Snowy Island Oysters	Black Rock Oysters
DISTRIBUTOR NAME/ADDRESS	Fancy Shellfish Inc. Bensons Harbor, ME	Pure Maine Shellfish Inc. Bensons Harbor, ME	Pure Maine Shellfish Inc. Bensons Harbor, ME
MANUFACTURER NAME/ADDRESS	Packaged By Fancy Farms	Snowy Island Farms	Black Rock Farms
LOT #/CODE #	ME 5952	ME 4582388	ME 99634
DATE OF PURCHASE	8/5/2018	8/9/2018	8/10/2018
EXPIRATION DATE	8/15/2018	8/15/2018	8/16/2018
SELL BY DATE	8/15/2018	8/15/2018	8/16/2018
SIZE/WEIGHT	2 – 5 lb. buckets	1-25 lb. bag	2-25 lb. bag
RETAIL FOOD EST. WHERE PURCHASED	Fancy Shellfish Inc.	Pure Maine Shellfish Inc.	Pure Maine Shellfish Inc.
SHELLFISH TAGS	Yes / Photographed	Yes / Photographed	Yes / Photographed
HACCP CCP			
RECEIVING AFH:	37° F Kenny Smith – prep cook	34° F Karen Tate – line cook	35° F Kenny Smith – prep cook
STORAGE AFH:	39° F Kenny Smith – prep cook	39° F Kenny Smith – prep cook	39° F Kenny Smith – prep cook
RECIPE ITEMS	Vegetable Oil All Purpose Flour Salt Black Pepper Shucked Oysters Eggs Bread Crumbs	Arrange Snowy Island and Black Rock oysters in an ice filled serving boat.	Arrange Snowy Island and Black Rock oysters in an ice filled serving boat.

FOOD
Steamed Mussels
Mighty Mussels
Maine Mussels Inc. Benson Cove, ME
Mighty Mussel Farm Cross Bay ME497762
8/9/2018
8/13/2018
8/13/2018
3 -25 lb. bags
Maine Mussel Inc.
Yes / Photographed
34° F
Karen Tate – line cook
39° F
Kenny Smith – prep cook

PREPARATION AFH:	<ol style="list-style-type: none"> 1. Combine All Purpose Flour, Salt & Black Pepper. 2. Coat oysters in flour mixture. 3. Dredge floured oysters in egg. 4. Roll oysters in bread crumbs. 5. Placed coated oysters in Deep Fryer. <p>Tom Knox – Line Cook</p>	<ol style="list-style-type: none"> 1. Placed 3 inches of fresh, clean grated ice in a large serving boat. 2. Place an equal number of each type of oyster partially buried in the ice. <p>Tom Knox – Line Cook</p>	<ol style="list-style-type: none"> 3. Placed 3 inches of fresh, clean grated ice in a large serving boat. 4. Place an equal number of each type of oyster partially buried in the ice. <p>Tom Knox – Line Cook</p>
EQUIPMENT USED AFH:	<p>Quart Bowl, Pitch Gas Deep Fryer Mixing Spoon Tom Knox - Line Cook</p>	<p>Stainless Steel Oyster Serving Boat Tom Knox – Line Cook</p>	<p>Stainless Steel Oyster Serving Boat Tom Knox – Line Cook</p>
COOKING AFH:	<p>Place 5 at a time in 375° for 2 min. Tom Knox - Line Cook</p>	<p>NA</p>	<p>NA</p>
COOLING AFH:	<p>Drained on clean paper towel for 1 minute Serve Hot Tom Knox - Line Cook</p>	<p>Oysters placed half buried in crushed ice to maintain temperature below 41° F.</p>	<p>Oysters placed half buried in crushed ice to maintain temperature below 41° F.</p>
HOLDING AFH:	<p>Do not Hold / Serve Hot</p>	<p>Held at 41° or below in ice.</p>	<p>Held at 41° or below in ice.</p>
REHEATING AFH:	<p>Do Not Re-Heat</p>	<p>NA</p>	<p>NA</p>
SERVICE AFH:	<p>Served with small bowl of Bensons Horseradish Dip Tom Knox - Line Cook</p>	<p>Oysters were hand shucked on request by Ian Metcalf – Executive Chef</p>	<p>Oysters were hand shucked on request by Ian Metcalf – Executive Chef</p>
OTHER	<p>NA</p>	<p>NA</p>	<p>NA</p>

AFH=ASSIGNED FOOD HANDLER

Question

- Is this a problem that the executive chef handshucked oysters?

GI Outbreak DMR Environmental Assessment

- Bivalve shellfish like mussels, clams and oysters are indiscriminate filter feeders
- Bivalve shellfish are often consumed raw or undercooked
- National Shellfish Sanitation Program regulates shellfish sanitation
- Maine Department of Marine Resources is the state authority for implementation of the NSSP (harvest area classification, dealer inspection, enforcement)



Harvest Areas

- DMR determines from shellfish tags and invoices that the oysters served were from two aquaculture farms located in the French River and from one farm in Blue Cove.
- The mussels are from an offshore aquaculture farm in Cross Bay.
- French River has a Vibrio Control Plan in effect from May-October.
- DMR checks to see if the harvesters and primary dealers have completed required annual training and have approved harvest/purchase plans on file.



Certified Shellfish Dealer Inspection

- The dealer tags indicate the Blue Cove oysters were purchased by Chez Angelique from the certified wholesale shellfish dealer Fancy Shellfish Inc.
- The dealer tags indicate the mussels were purchased by Chez Angelique from the certified wholesale shellfish dealer Maine Mussels Inc.
- DMR inspector visits Fancy Shellfish Inc. and Maine Mussels Inc. to inspect records and compliance with HACCP plans.
- The companies are in compliance with all laws and regulations and do not buy from harvest areas with Vibrio Control Plans.



Certified Shellfish Dealer Inspection Continued

- The dealer tags indicate the Snowy Island Inc. oysters from French River were purchased by Chez Angelique from the certified wholesale shellfish dealer Pure Maine Shellfish Inc.
- DMR inspector visits Pure Maine Shellfish Inc. to inspect records and compliance with HACCP plan.
- The company is not certified to purchase oysters from the French River during the Vp control months.
- Copies of receiving logs related to oysters implicated in illnesses are taken.



Certified Shellfish Dealer Inspection Continued

- Receiving logs show that the oysters from Snowy Island Shellfish Farm in French River were delivered to the dealer 20 hours after harvest and were not refrigerated or iced after harvest.
- A review of the ambient air temperature data ($>80^{\circ}\text{F}$) for the date of harvest indicate the oysters were required to be delivered to the dealer within 2 hours of harvest.
- The oysters from the other farm in the French River were delivered within the requisite time period.



Question

- How many people think temperature abuse will cause the bacteria levels in oysters to increase?

Embargo

- DMR embargoes all oysters from the French River present at Pure Maine Shellfish and orders their destruction.
- DMR requests invoices to track oysters that were sold by Pure Maine Shellfish to other retailers and dealers.
- Marine Patrol is provided a list of dealers/retailers with implicated product and embargoes/destroys anything that is still in the marketplace.
- Marine Patrol issues a summons to Pure Maine Shellfish for not complying with the Vibrio Control Plan regulations.



Investigation of Harvest

- Marine Patrol interviews the owner of Snowy Island Shellfish Farm.
- The owner admits that they did not keep temperature logs, ensure product reached the dealers within the required timeframe, nor check that the dealers were certified to receive product from the French River.
- Marine Patrol issues a summons for failure to comply with the Vibrio Control Plan regulations.

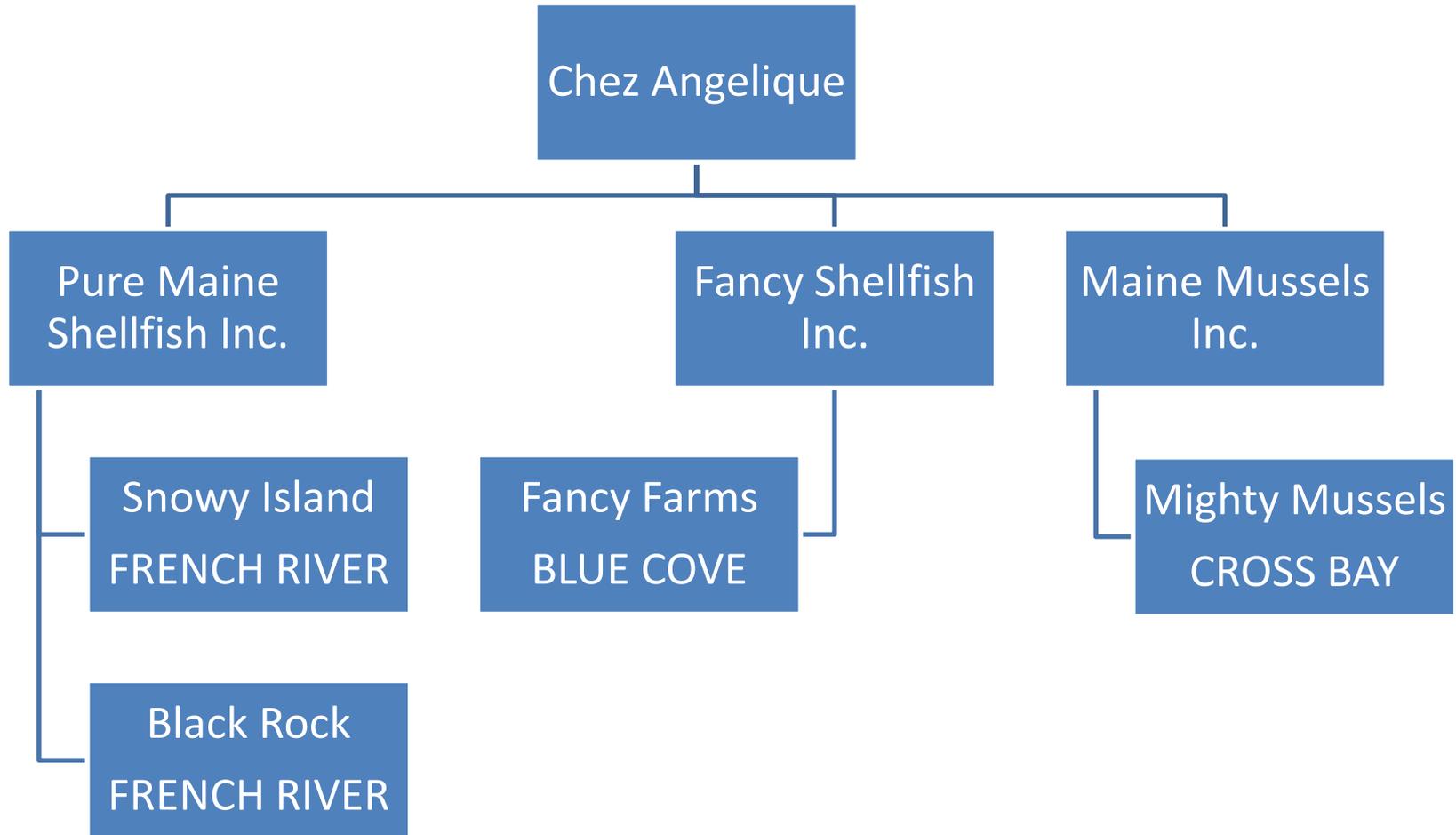


Additional Actions

- DMR communicates with growers in French River about the illnesses and the importance of complying with the Vibrio Control Plan.
- DMR reopens the French River after the required 21 day closure and after Vp levels are below established standards.

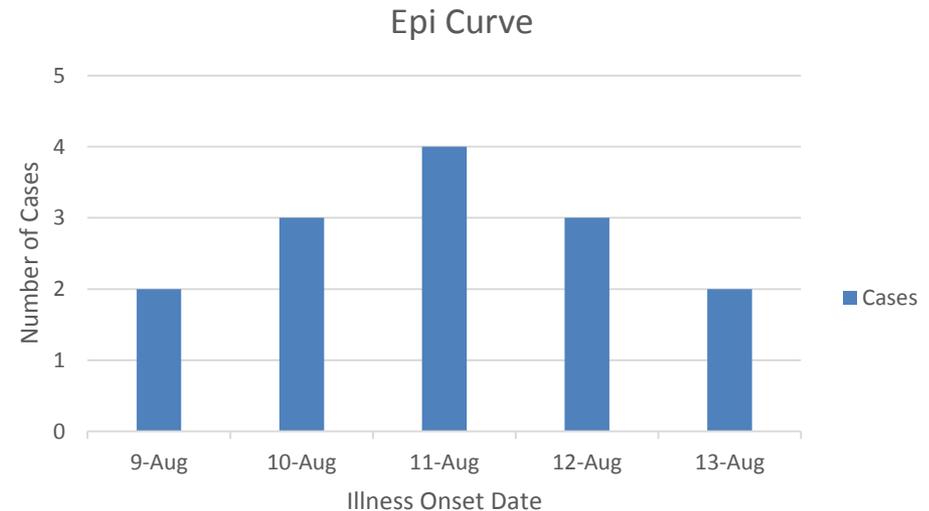


Traceback Flow Chart



EPI outbreak data analysis

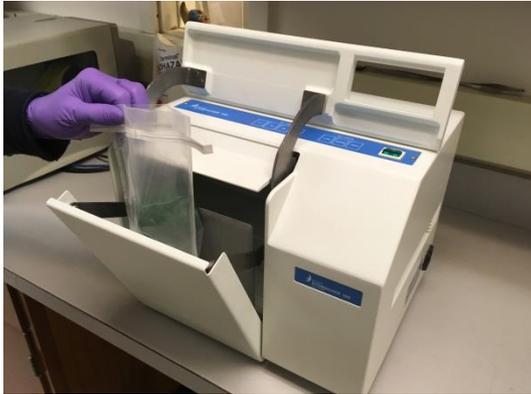
- EPI enters all of the data collected from the survey into a database and then performs analysis to determine if any of the data suggests one or more of the foods was the culprit.
- Epi curve – determining the onsets of illness.
 - Useful to determine the characteristics of the disease
- Also look for an association between an exposure and illness



Laboratory Testing: Specimens Received

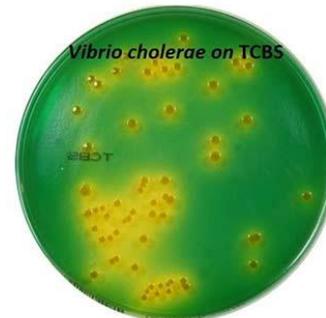
- HETL receives a total of 6 specimens for *Vibrio parahaemolyticus* testing
 - 2 stool specimens from party attendees
 - 2 *V. parahaemolyticus* cultures that were isolated from one party attendee and the executive chef at a local hospital lab
 - 2 samples of oysters from different growing areas

Laboratory Testing: Processing of Oyster Samples



Processed 25g of each Oyster sample

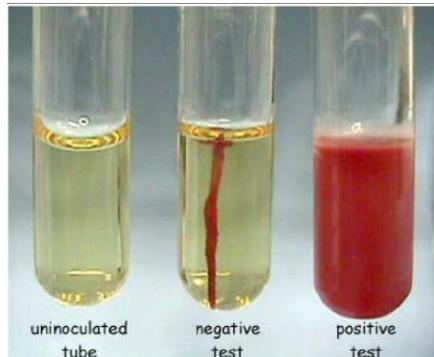
O/N incubation at 37°C
Plated on selective media



Vibrio cholerae on TCBS Agar



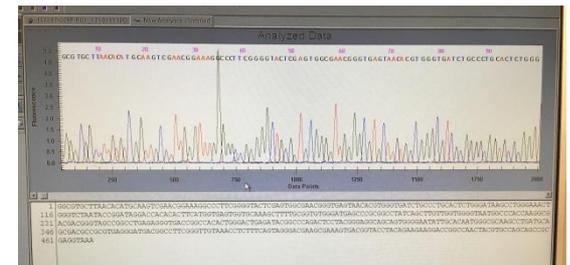
Vibrio parahaemolyticus on TCBS Agar



Motility Agar



Saline Broth

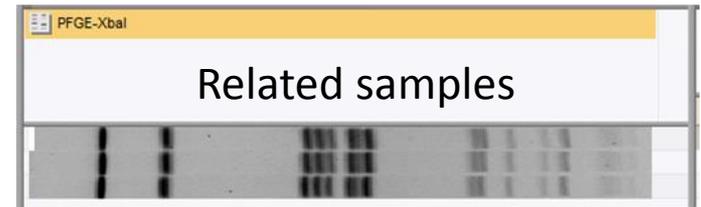
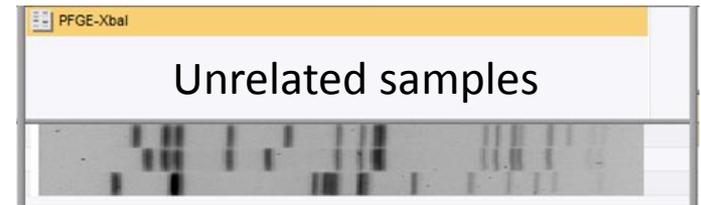
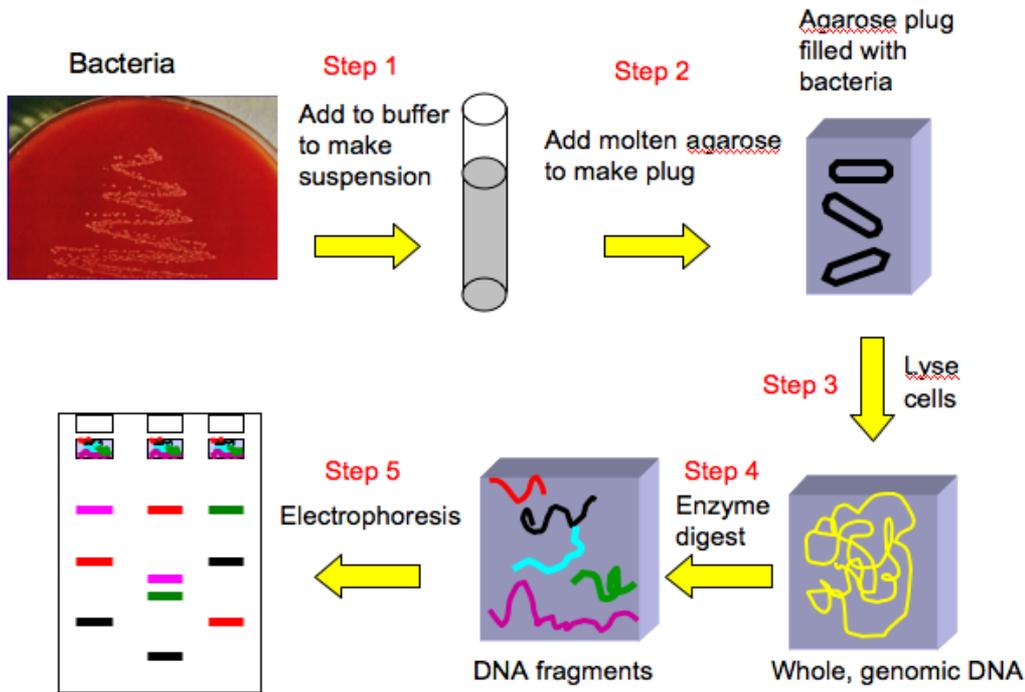


16S Sequencing

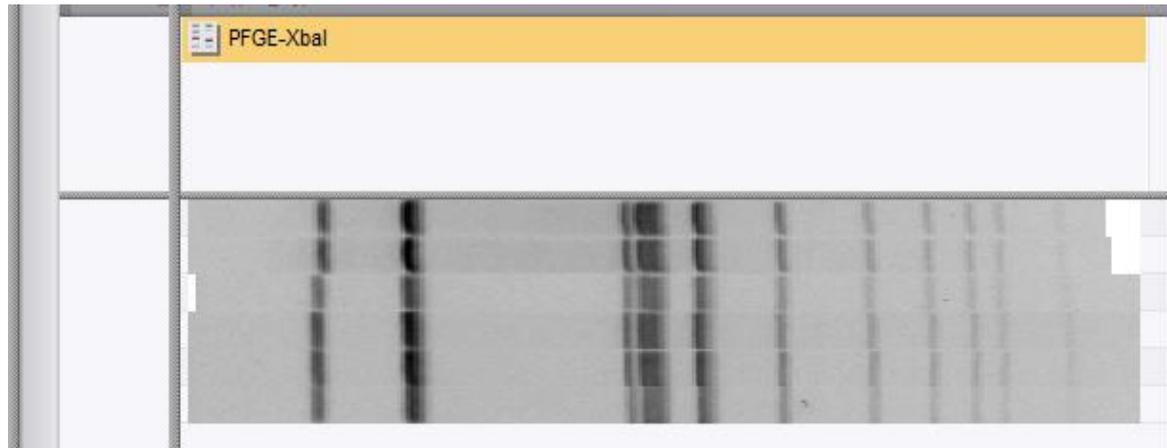
Laboratory Testing – Culture Results

- *V. parahaemolyticus* are found in the oysters
- *V. parahaemolyticus* are cultured out of the stool specimens and confirmed in the previously isolated cultures
- Whole Genome Sequencing (WGS) is performed in-house, and the positive samples were sent to Federal CDC for Pulse Field Gel Electrophoresis (PFGE)

Laboratory Testing – PFGE



Laboratory Testing – PFGE results



Sample 1: Oyster 1
Sample 2: Patient 1
Sample 3: Patient 2
Sample 4: Oyster 2
Sample 5: Patient 3
Sample 6: Patient 4

Comparison of *V. parahaemolyticus* isolates from clinical specimens and oyster samples

Are these samples related based on PFGE?

Laboratory Testing – WGS

- WGS is the process of determining the entire sequence of an organism's genome at a single time
- The resulting genomic sequences are compared against each other looking for single nucleotide polymorphisms (SNPs), which are a variation in a single nucleotide that occurs at a specific position in the genome. They are represented in a “tree” that shows their relatedness
 - Samples with <20 SNPs are considered related, and are usually included in an outbreak
- WGS is considered to be the laboratory gold standard for defining which isolates are part of an outbreak

SNP Tree analysis of clinical specimens and oyster samples



Which sample(s) would be part of the outbreak?

Laboratory Testing - Conclusions

- Oyster Sample 4 was from Snowy Island from French River
- Oyster Sample 1 was Black Rock from French River
- The results of all laboratory testing indicates that the 4 patient samples and one oyster sample (Sample 4) were all the same strain.

Overall conclusions and communication back to parties involved

- This lab data suggests that the oysters from Snowy Island Shellfish Farm from French River are the cause of the outbreak.
- The epi data collected point toward those consuming the implicated oysters as having an increased risk of becoming ill. The epi data is consistent with the conclusions from the laboratory data and the environmental traceback.
- The outbreak team communicates the findings to the parties involved.
- Makes recommendations on ensuring food safety.
 - HIP provides education on corrective action items and provide education on employee health and restrictions.
 - DMR follows up with education, closures, and embargos.
 - EPI makes general food safety and other recommendations.

Thank you. Questions?



Shellfish Filter Feeder Demonstration