

Oyster Associated Norovirus Outbreaks Chattanooga, Tennessee

Sarah Stuart Sloan, MPH
Margaret Zylstra, RN, BSN

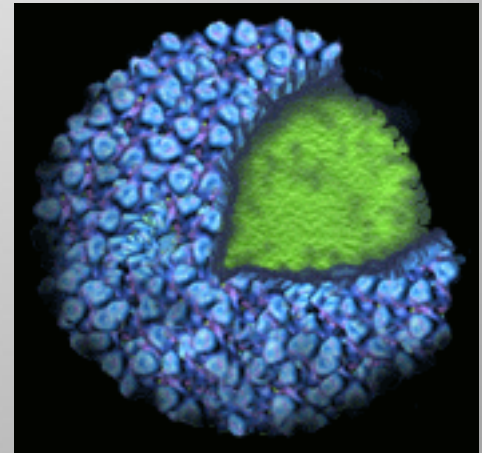
Chattanooga-Hamilton County
Health Department

Outline

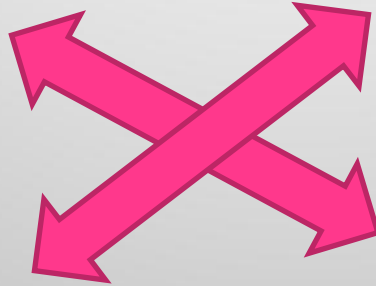
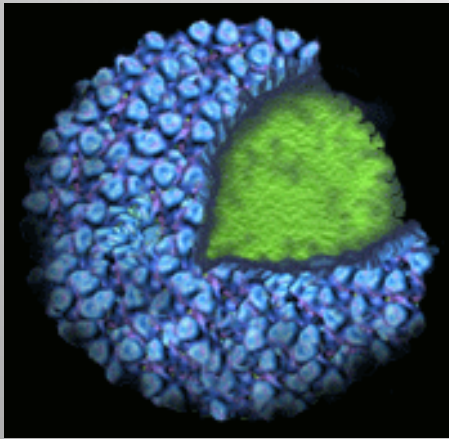
- Overview
- Characterize outbreaks
- Review methods & analytics
- Prevention measures & conclusions

Norovirus

- Human fecal pathogen
- Low infectious dose
- Environmentally stable
- Contaminates fresh and marine waters



When their Paths Cross...



Illness!

Outbreak – December 2007

- 11 cases with raw oyster exposure from 2 facilities
- Ate oysters Dec. 13 – 21
- Harvested Dec. 3 or Dec 10
- Harvest area A-3 West Karako Bay, LA
- Matching Norovirus G2 found in stool and oysters

Packed by
Bon Secour Fisheries, Inc.

TAG NO. 085898

Bon Secour, AL 36511 Certification Number AL49
Original Shipper Certificate Number LA1988 SS
Oysters Harvested in Louisiana WILD PRODUCT OF USA
Harvest Date 12/10/2007 Harvest Area A-3 WEST KARAKO
Bon Secour Fisheries Lot Number
Net contents of this Package 1 BOX BBL Shell Oysters

THIS TAG IS REQUIRED TO BE KEPT WITH THE CONTAINER UNTIL EMPTY AND THEN
MUST BE KEPT ON FILE FOR 90 DAYS.

FOR IMPORTANT CONSUMER INFORMATION PLEASE READ REVERSE SIDE OF THIS TAG.

LOUISIANA SHELLFISH HARVEST AREAS

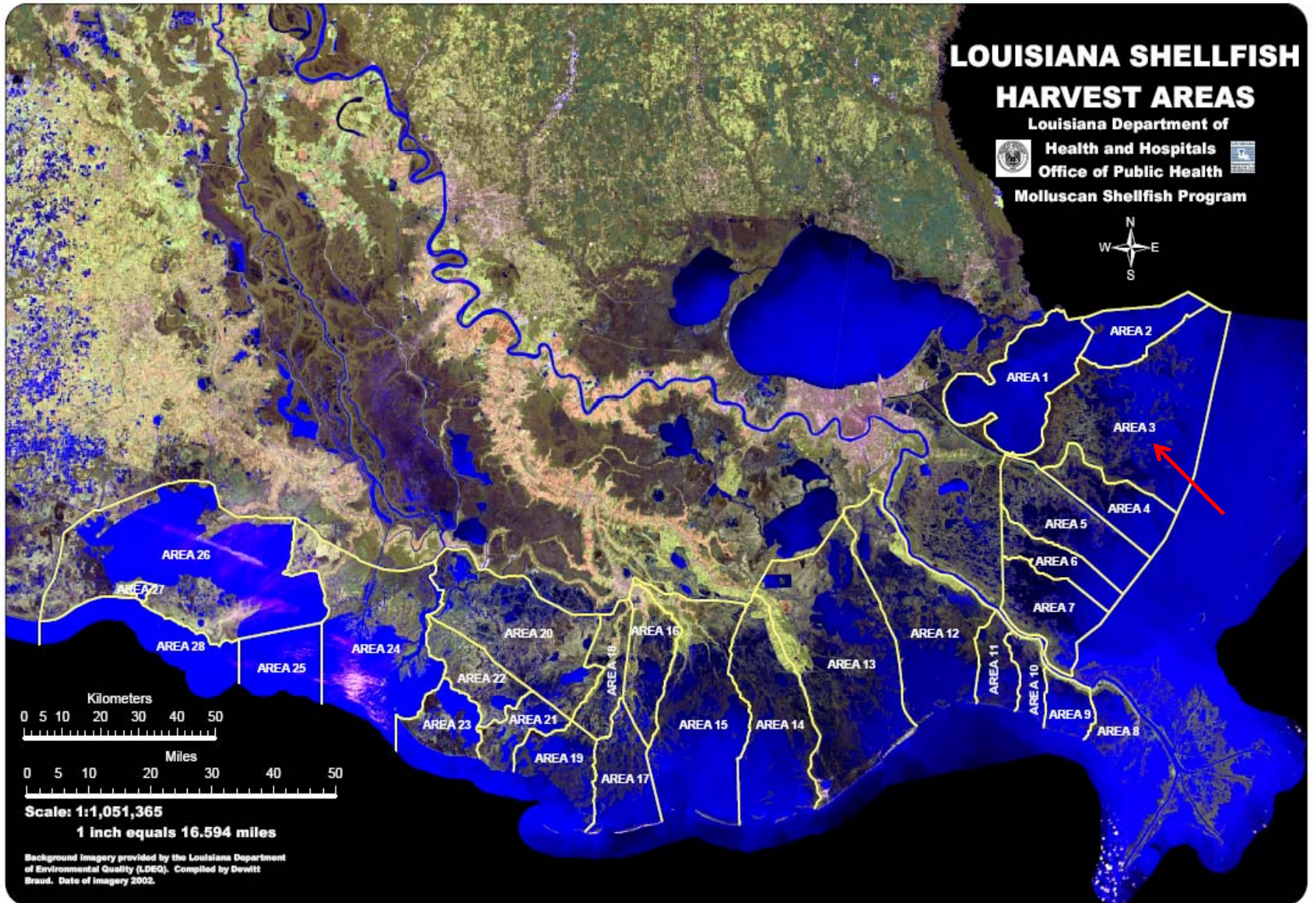
Louisiana Department of



Health and Hospitals
Office of Public Health



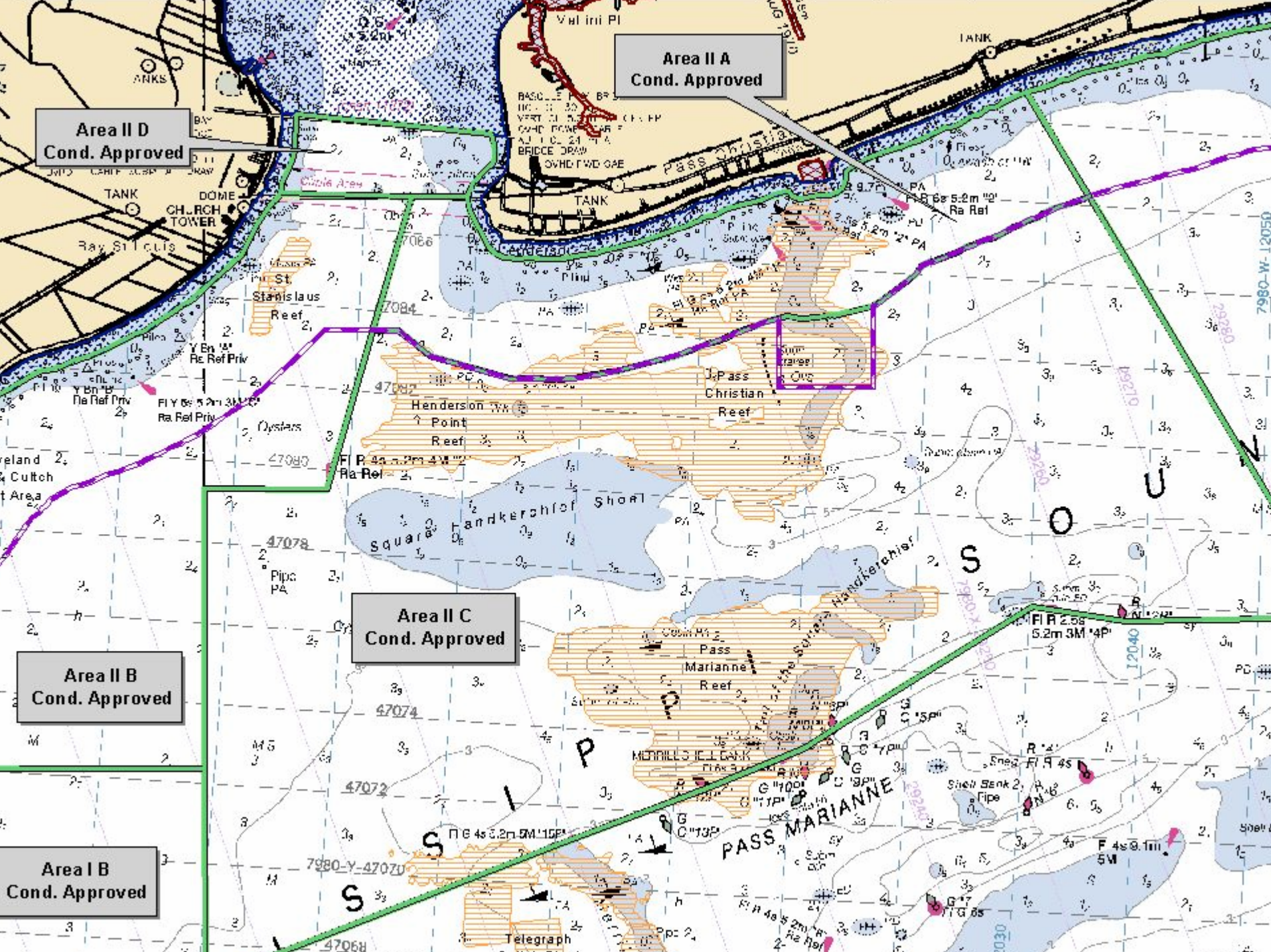
Molluscan Shellfish Program



Background imagery provided by the Louisiana Department of Environmental Quality (LDEQ). Compiled by Dewitt Braud. Date of imagery 2002.

Outbreak – January 2009

- 24 cases with raw oyster exposure
- Ate oysters Jan 12 – 19
- Harvested Jan. 5 from Area II C, MS
- Matching Norovirus G2 found in stool and oysters



Area II D
Cond. Approved

Area II A
Cond. Approved

Area II C
Cond. Approved

Area II B
Cond. Approved

Area I B
Cond. Approved

Outbreak – March 2009

- 13 cases, 12 with raw oyster exposure
- Ate oysters March 5 – 8
- Harvested Feb. 24 from Area II C, MS
- Norovirus G1 found in clinical specimens

Foodborne Outbreak Routines

- Epi staff interview all callers with illness
- 72 hour food history is collected
- Ill & non-ill food analysis conducted
- Facility inspection completed
- Clinical specimen testing done
- Case-control analysis when food implicated

Methods

- Questionnaire—interview ill and non-ill
 - Objective questionnaire
- 72-hour food history of ill
- Food history of non-ill
- Complete inspection of restaurant(s)

Appendix A Chattanooga-Hamilton County Health Department Foodborne Illness Form

Date/Time: ___/___/___ :___ am / pm Interviewer: _____

Name of Ill/Non-ill Person: _____ DOB: _____

Phone: (____) _____ Cell Work Other phone _____

Address: _____

Caller's Name (if different than above): _____

Caller's Relationship to Ill (if other than self): _____

Reason for Call: _____

Name of Establishment: _____

Location: _____

Date/Time of Meal: ___/___/___ :___ am / pm

Predominant Symptoms:
 Fever _____° Y N
 Chills _____ Y N
 Nausea _____ Y N
 Vomiting _____ Y N
 Diarrhea _____ Y N
 Cramps _____ Y N
 Headache _____ Y N
 Body Aches _____ Y N
 Fatigue _____ Y N
 Blood in Stool _____ Y N
 Other _____

Onset/Incubation
 Date/Time of Onset of First Symptom: ___/___/___ :___ a.m./p.m. First Symptom _____
 Incubation: _____ (minutes/hours/days) Duration: _____

Medical Care
 Did ill seek medical care?: Yes / No Date: ___/___/___
 Doctor/Facility _____ Diagnosis: _____
 Clinical Specimen: Yes / No Type: _____ Result: _____

Food(s) Consumed Dine in ___ Take out ___ Leftovers taken: Yes/No/DK
 Drink _____ Bread/Rolls/Chips/Dip _____
 Appetizer _____ Salad _____ Dressing _____
 Entrée _____
 Dessert _____ Other food _____

Others Ill

Name	Phone
_____	_____
_____	_____
_____	_____

Daycare Worker: Yes / No Foodhandler: Yes / No Prevention Education Provided: Yes / No

Comments: _____

Food History 72 Hours Prior to Symptom Onset

Date/Time	# Eating Meal	Foods/Drinks Consumed Please include the following:			Location Food Prepared	Location Food Consumed
		Drinks Dressing Dessert	Appetizer Entrée	Salad Bread/Rolls		
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___
B' fast ___ Lunch ___ Dinner ___ Other ___ ___/___/___ :___ am/pm					___ Home ___ Other (specify) ___ Other ___	___ Same as prepared ___ Other ___

Where did you buy the groceries consumed in the last 72 hours? _____
 Name _____
 Case ___ Not a case ___

Methods

- Interview foodhandlers
- Case-control study
- Stool specimens from ill
- Oysters --if available from same batch served to ill
- Oyster tags

How do we implicate oysters?

- Food Analysis
- Odds ratios
- Laboratory results
 - PCR
 - PFGE

Case-Control Study Analyses

	Disease (Cases)	No Disease (Controls)
Exposed	a	b
Not Exposed	c	d

Odds Ratio (OR) = ad/bc

Measures odds of exposure of a given disease

Ranges from 0 to Infinity

Dec 2007

	Cases	Controls
Ate Oysters	8 (+1)	3 (+1)
Did not	0 (+1)	17 (+1)

OR = 40.5 (Infinity if 1 is not added)

Those that ate oysters were (at least) 40.5 times as likely to become ill.

Jan 2009

	Cases	Controls
Ate Oysters	19	3
Did not	5	28

OR = 35.5

Those that ate oysters were 35.5 times as likely to become ill.

Mar 2009

	Cases	Controls
Ate Oysters	12 (+1)	3 (+1)
Did not	0 (+1)	27 (+1)

OR = 91 (Infinity if 1 is not added)

Those that ate oysters were (at least) 91 times as likely to become ill.

Laboratory Methods

- Stool
 - Test for viruses
 - Norovirus genotype 1 and 2
- Oysters
 - Test for viruses (in gut)
 - Norovirus genotype 1 and 2
- If same type in stool and gut of oysters, additional testing for homology
 - Nucleic acid sequencing

Sequence Analysis

Sequence Analysis:

100% identity between norovirus nucleic acid sequence amplified from oysters and stool specimen (K07X000007); 77 base pair fragment analyzed (primer sequences omitted)

Strand=Plus/Minus

Oyster 5'

TTCATTACACCTTCGGGAGCAAGATTGCGATCGCCCTCCCATGTGCTGAGGTCAGAAAA

|||||

Stool

TTCATTACACCTTCGGGAGCAAGATTGCGATCGCCCTCCCATGTGCTGAGGTCAGAAAA

Oyster TCTCATCCATCTAAACA

|||||

Stool TCTCATCCATCTAAACA

Descriptive Epidemiology			
	December 2007	January 2009	March 2009
Number of cases	11	24	13
Laboratory confirmed cases	3	6	4
Norovirus genogroup identified by PCR	G2	G2	G1
Raw oyster consumption among cases	100%	79%	100%
Symptoms			
Diarrhea	11	20	12
Abdominal cramping	10	15	9
Vomiting	6	19	8
Fever	5		3
Nausea	10	19	11
Headache	7	10	9
Incubation period, media (hours)	37	31	37
Case-Control Studies			
Risk factors	Count	OR (CI)	OR (CI)
Raw oysters	11	35.5 (7.6-166.3)	Infinity
Fire-roasted oysters	0	3.8 (0.9-16.9)	0
Fried oysters	0	0	0
Wedge salad	0	0.8 (0.1-5.5)	2 (0.5-8.9)
Oyster Testing			
Harvest site (see map)	Louisiana A-3 West Karako	Mississippi Area 2C	Mississippi Area 2C
Norovirus rt PCR	Positive	Positive	Negative
Genogroup identified	G2	G2	NA
Sequence homology (human and oyster)	100%	100%	NA
Regulatory Actions			
Date of oyster bed closure	December 21	Previously closed	March 17
Date recall initiated	December 21	January 23	March 31

Conclusions

- Ongoing risk of norovirus illness associated with raw oyster consumption
- Recurrent outbreaks of norovirus from a single shellfish harvest area
 - Closure of harvest area prevents further illness
- Oyster exposure
 - Human sewage contamination
 - Overboard sewage dumping
- Surveillance for contamination with norovirus lacking
- Involve state and federal partners quickly

Discussion

- What can we do to prevent future contamination?
- Length of oyster bed closure
- What is each of our roles in prevention?
 - Hamilton County HD
 - Suspect oysters if ill consumed
 - Collect oysters and tags from restaurant ASAP
 - Facilities that serve oysters must document (date/time)
 - Other local agencies
 - Include epi staff in foodborne illness surveillance

Working Together

- Local
 - Epidemiology
 - Environmental Health
 - Other?
- State
 - TN Dept of Health
 - TN Dept of Health Lab
 - TN Dept of Agriculture
 - MS Dept of Marine Resources
 - LA State Dept of Health
 - Others?
- Federal
 - FDA Office of Food Safety and Office of Emergency Operations
 - FDA Shellfish Testing Lab
 - Others?

Discussion

- What is each of our roles in prevention?
 - State
 - Federal
- Methods for implicating oysters
 - Analytical
 - Laboratory
- Other discussion topics?

Contact Information

- Margaret Zylstra, RN, BSN
margaretz@hamiltontn.gov
- Sarah Stuart Sloan, MPH
sarahs@hamiltontn.gov