North Carolina Produce Safety Professionals Conference

Wednesday, March 14, 2018

How a foodborne outbreak is investigated

Three Scenarios

- NC source and NC investigation
- Out of state source and out of state investigation
- Out of state source and CDC investigation

NC source & NC investigation



Steps of an Outbreak Investigation North Carolina Communicable Disease Branch



- 1. Identify investigation team and resources
- 2. Establish the existence of an outbreak
- 3. Verify the diagnosis
- 4. Construct a working case definition
- 5. Case finding: Find cases systematically and develop line list
- 6. Perform descriptive epidemiology and develop hypotheses
- 7. Evaluate hypotheses and perform additional studies (as necessary)
- 8. Implement control measures
- 9. Communicate findings
- 10. Maintain surveillance

July 2012 N.C. Division of Public Health Epidemiology Section / Communicable Disease Branch / Medical Consultation Unit Telephone: 919-733-3419 (24/7)

Partners

LHD, Restaurant, Dept of Ag, CDC

Out of state source & out of state investigation



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Out of state source & CDC investigation



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Outbreak Detection Methods

PFGE; Increase above the norm; Sampling; Phone calls



Questions?



Extra Slides

- Epi Methods (Cohort Study)
- Line list
- Epi curve

Epi Methods

Cohort Study

Case-Control Study







MORE ON THIS

- Cause of illness at student conference undetermined
- Pive hospitalized after illness outbreak at student leadership conference
- Raw: Students fall ill at Sheraton





Cause identified, source unclear for students' illness



Students sickened at Raleigh conference

Initial	Stats
150	Ill attendees
	Received onsite
25	IV hydration
Multiple	EMS trucks onsite
5	Transferred to hospital

What partners need to be involved?





What partners need to be involved?





Demographics



Symptomology



Epi Curve





Analytic Study

Cohort study:

Definition





What partners need to be involved?



Epi Curve



Date

Results from analytic study

		EXPOSED				ΝΟΤ ΕΧΡ				
		Not ill	Total	Attack Rate	Ш	Not ill	Total	Attack Rate	Rel risk	CI
Mtg rm water				61%				65%	.94	
Thr pizza				63%				63%	1	
Fri bkfst				64%				60%	1.1	
Fri lunch										
Fri dinner										



Results from analytic study

	EXPOSED				NOT EXPOSED					
	111	Not ill	Total	Attack Rate	Ш	Not ill	Total	Attack Rate	Rel risk	CI
Mtg rm water	112	72	184	61%	198	109	307	65%	.94	(0.8, 1.1)
Thr pizza	126	73	199	63%	184	108	292	63%	1	(0.9 <i>,</i> 1.1)
Fri bkfst	245	137	382	64%	65	44	109	60%	1.1	(0.9 <i>,</i> 1.3)
Fri lunch	279	158	437	64%	30	21	51	59%	1.1	(0.9 <i>,</i> 1.4)
Fri dinner	297	145	442	67%	12	34	46	26%	2.6	(1.6 <i>,</i> 4.2)



Epi Curve



Date

Epi Curve



Date

What partners need to be involved?



Symptomology



Symptom Groups

	#	%
Vomiting (no D)	10	3
Diarrhea (no V)	262	85
V & D	38	12
Total	310	

Only 15% with vomiting!

We'd expect more than 50% to have vomited at the time if norovirus was the cause.



Exhibit visited	Cases (%) n=45	Controls (%) n=188	OR	CI	р
Commerford and Sons Petting Zoo	5/44 (11%)	23/188 (12%)	0.9	0.3 - 2.6	1
Crossroads Farm Petting Zoo	36/45 (80%)	64/187 (34%)	7.7	3.5 - 17.0	<0.001
Children's Barnyard	21/44 (48%)	50/186 (27%)	2.5	1.3 - 4.9	0.01
State Fair Ark	12/45 (27%)	65/188 (35%)	0.7	0.3 - 1.4	0.4
Sheep and Goat tent	8/42 (19%)	32/186 (17%)	1.1	0.5 - 2.7	0.8
Kelley Building	8/44 (18%)	52/186 (28%)	0.6	0.2 - 1.3	0.3
Graham Building	31/44 (70%)	94/187 (50%)	2.3	1.1 - 4.8	0.02
Rabbit Barn	11/44 (25%)	49/187 (26%)	0.9	0.4 - 2.0	1
Poultry tent	19/44 (43%)	49/187 (26%)	2.1	1.1 - 4.2	0.04
Pony Ride	9/45 (20%)	27/187 (14%)	1.5	0.6 - 3.4	0.4

Table 7. Associations with illness by visits to various animal exhibits, North Carolina State Fair, 2004.

Table 4: Case Control Results – Select Animal Exhibits (Note: Denominator excludes missing values)

Variable	Cases	Controls	OR		u
	<u> </u>	<u> </u>			
Any Animal Exposure	22 (94)	111 (69)	5.0	1.1	21.9
Camel Ride	7 (29)	10 (6)	6.2	1.7	20.6
Milking Booth	8 (38)	26 (16)	2.9	1.7	11.9
Children's Barnyard	16 (76)	68 (44)	4.1	1.4	11.9
Petting Zoo	17 (74)	62 (39)	4.4	1.7	11.9
Pet Any Animal	17 (94)	35 (57)	11.9	1.5	95.4
Fed Any Animal	16 (94)	26 (42)	22.2	2.8	177.7

Epi Methods

Line lists

Identifying Information

1	First-Name	Last-Name	Street1	City	State	Zip-Code	County	Home-Phone
2								
3	Ally	Alligator	100 Swamp Lane	Cedar Park	NC	27514	Flowerbank	111-111-1111
4	Benjamin	Bear	506 Forest Road	Cedar Park	NC	27514	Flowerbank	222-222-2222
5	Carie	Cat	52 House Circle	Cedar Park	NC	27514	Flowerbank	333-333-3333
6	Donald	Duck	200 Disney Way	Cedar Park	NC	27514	Flowerbank	444-444-4444
7	Emily	Elephant	64 Safari Ave	Cedar Park	NC	27514	Flowerbank	555-555-5555
8	Farrah	Fox	182 Tree Farm Road	Cedar Park	NC	27514	Flowerbank	777-777-7777
9	Gary	Gorrilla	70 Jungle Drive	Cedar Park	NC	27514	Flowerbank	888-888-8888
10	Henry	Horse	300 Farm Court	Cedar Park	NC	27514	Flowerbank	999-999-9999

Demographic Information

1	Gender	DOB	Age at Onset	Foodhandler	HCW
2					
3	F	1/2/1986	30	Y	V
4	M	12/1/1988	27	N	N
5	F	5/7/1992	23	N	N
6	M	4/4/1973	42	Y	N
7	F	6/18/1979	36	N	N
8	F	8/24/1982	34	N	Υ
9	M	11/25/1981	34	N	N
10	M	9/11/2001	14	N	N

Clinical Information

1	Date of Report	Date of Onset	Died	Hospitalized	ER Visit	Provider Visit	Vomiting	Diarrhea	Bloody Stools	Fever	Abdominal Cramps
3	4/14/2016	4/9/2016	N	N	Y	N	Y	Y	Y	Y	Y
4	4/17/2016	4/11/2016	N	N	Y	N	Y	Y	Y	unknown	Y
5	4/23/2016	4/14/2016	N	N	Y	N	Y	Y	Y	Y	Y
6	4/18/2016	4/7/2016	N	N	N	Y	Y	Y	unknown	Y	Y
7	4/27/2016	4/10/2016	N	N	N	Y	N	Y	N	Y	Y
8	4/23/2016	4/14/2016	N	N	N	Y	unknown	Y	unknown	Y	Y
9	4/20/2016	4/13/2016	N	N	N	Y	N	Y	Y	Y	Y
10	4/24/2016	4/19/2016	N	Y	Y	N	Y	Y	N	unknown	Y

Laboratory & Case Classification Information

1	Salmonella species	Serotype Enteriditis	PFGE .0246	Confirmed	Probable	Suspect	Why Status?
2							
3	Υ	Υ	Υ	Υ			PFGE match
4	Υ	Υ	Υ	Y			PFGE match
5	Y	Υ	Υ	Y			PFGE match
6	Y CP	Y	Υ	Υ			PFGE match
7	Y	Υ	Υ	Υ			PFGE match
8	Y	Υ	Υ	Y			PFGE match
9	Y	Υ				Υ	PFGE pending
10	Y	Υ				Υ	PFGE pending

Exposure Information

1	Travel to Flowerbank County	Ate at Restaurant A	Swam in River B	Attends Day Camp C	Other Exposures
2					
3	Y	N	Y	N	lifeguard at River B
4	Y	Y	Y	N	works at Day Camp C
5	Y	Y	N	Y	
6	Y	unknown	N	Y	works at Restaurant A
7	Y	N	Y	N	
8	Y	Y	Υ	N	ate at McDonalds
9	Y	N	unknown	Υ	shops at Wal-Mart
10	Y	N	unknown	Y	



Epi Methods

Number of III Patrons and Staff by Date of IIIness Onset

Salmonellosis Outbreak: Cumberland County (n=15)



Date of Illness Onset

Number of III Patrons and Staff by Date of Illness Onset

Salmonellosis Outbreak: Cumberland County (n=22)



Number of III Patrons and Staff by Date of Illness Onset

Salmonellosis Outbreak: Cumberland County (n=100)



Number of III Patrons and Staff by Date of Illness Onset

Salmonellosis Outbreak: Cumberland County (n=100)



Number of III Patrons and Staff by Date of Illness Onset

Salmonellosis Outbreak: Cumberland County (n=101)



Date of Illness Onset

Number of III Patrons and Staff by Date of Illness Onset

Salmonellosis Outbreak: Cumberland County (n=101)



EPIDEMIOLOGY RESULTS

Total III 100 Hospitalized 8 Counties Represented 11 Ages 17yrs-81yrs Median: 45 yrs

Exposure	Relative Risk
FOOD	
Employee Potluck	0.62
Café Breakfast Buffet	0.89
Café Lunch Buffet	1.09
All American Grill	3.6
WORK TASK	
All American Grill Supervisor	4.3

RESULTS

Those who ate/ drank at the All American Grill were 3.6 times more likely to become ill when compared to those who did not eat/drink at the All American Grill