Challenges and Resources for Cluster Investigation

2012 Epi Rapid Response Team Conference
July 31, 2012
KCTCS, Versailles, KY

Srihari Seshadri, MBBS, MPH
Barren River District Health Dept.
Initial Notification:

3rd Week of March, 2011

- Communicable Disease Team nurses notified me that they had investigated a couple of cases of Salmonella in the last few weeks.
Initial reaction

They’re making me work!
Begin Investigation

- Reviewed all charts of recent Salmonella cases
- Created a line list
- Looked for commonality
Line List

What would your columns in the line list be?
Line list

- Name
- Age
- Sex
- County
- KY EPHRS Investigation Id
- Address
- Date of Onset
- Serogrouping
<table>
<thead>
<tr>
<th>County</th>
<th>Investigation #</th>
<th>Date of Onset</th>
<th>Serogrouping/Grouping</th>
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<tbody>
<tr>
<td>Hart</td>
<td>000087693</td>
<td>2/9/2011</td>
<td>Enteritidis Group D</td>
</tr>
<tr>
<td>Hart</td>
<td>000087954</td>
<td>2/15/2011</td>
<td>Enteritidis Group D</td>
</tr>
<tr>
<td>Hart</td>
<td>000087900</td>
<td>2/19/2011</td>
<td>Enteritidis Group D</td>
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<td>Enteritidis Group D</td>
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<tr>
<td>Barren</td>
<td>000087728</td>
<td>2/12/2011</td>
<td>Enteritidis Group D</td>
</tr>
<tr>
<td>Hart</td>
<td>000088252</td>
<td>2/20/2011</td>
<td></td>
</tr>
</tbody>
</table>
Epi Curve

What about HISTOGRAM?
Epi Curve

Date of Onset

Number of Cases

GIS Map

Salmonella Outbreak
March 2011

Six of the ten cases got their water from Greens River Water District and two people got their water from the Munfordville Water Works. Because of the Karst topography, there is little relation to the surface water in the area.

Legend
- Unrelated Strain Type
- Slightly Contaminated
- Water Tank
- Water Plant
- Munfordville Water Works
- Green River Water District
- Roads
- City Boundaries
- County Boundaries

Drawn by: Chip Kraus
Date: 03-20-11
Baseline Data for Reportable Diseases
Baseline Data *(simple)*
Baseline Data *(detailed)*

Salmonellosis in Hart County

<table>
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<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
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<td>0.20</td>
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<td>0.40</td>
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</table>
E-mailed Division of Epidemiology, KY DPH: March 29, 2011
Initial Response: March 29, 2011

- No unusual increase in your district
- An increase in enteric diseases this year in KY
- *Salmonella* Enteritidis is one of the most common serotypes, it is possible they would not be a PFGE match
- Lab scientists in the PFGE lab at DLS will alert us if they see a match
S. Enteritidis outbreak in Barren River and Lincoln Trail District
Currently have 6 cases that are a match to a national cluster reported by Wisconsin
PFGE lab reports this as being a rare S. Enteritidis pattern
IL and WI epidemiologists are investigating a cluster of 3 S. Enteritidis isolates that may be linked to Guinea pig exposure
Discussion with CDC epi-contact for this cluster

- They have closed the investigation at this point unless new cases develop.
- The 6 KY cases that matched were an xbal-pattern match which is the 1st enzyme for PFGE
- They are only looking at the blnl-pattern matched cases which is the 2nd enzyme for PFGE, CDC is not considering ours to be a match.
- DLS PFGE lab only performs 2nd enzyme testing when it is requested by CDC.
Pulsed-Field Gel Electrophoresis: PFGE

- Serotyping analysis
- Transfer to PFGE lab for PFGE process
- Image captured using a Bio-Rad Gel Doc XR imaging system
- Resulting image is analyzed using BioNumerics software and uploaded to PulseNet
- CDC then assigns a PFGE Pattern & Cluster Code
- The whole process, from receipt of samples in Bacteriology to final image upload to PulseNet takes about 10 days
DLS identified 8 cases (5 in Hart, 2 in Barren and 1 in Laure County) of Salmonella Enteritidis with PFGE pattern JEGX01.0021 and cluster code 1012W1JEG-1 in April 2011

(Isolates 6 and 7 are a match)
Share your work!
Communicate with Healthcare Providers

Improving the Quality of Medical Care in Warren County, Kentucky

The mission of the Medical Society is to provide a forum of colleagues for discussions about the ever-changing face of medicine. In addition, the physicians of the Medical Society strive to seek continuing medical education for our members, and to improve the quality of medical care in Warren County.

The Medical Society supports the community through student scholarships and sponsorship of specific worthwhile causes.

<table>
<thead>
<tr>
<th>2012 Meeting Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>(First Tuesday, 6:30 PM, at Mariah’s)</td>
</tr>
<tr>
<td>Jan 3</td>
</tr>
<tr>
<td>Aug 7</td>
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</table>
Communicate with Healthcare Providers

EPI Report

Communicable Disease Reports for Barren River District

06/29/12
06/22/12
06/15/12
06/08/12
06/01/12
05/25/12
05/18/12
05/11/12
05/04/12
04/27/12
04/20/12
04/13/12
04/06/12
03/30/12
03/23/12
03/16/12
Final 2011 Report-Revised 03/30/2012
Final 2010 Report-03/18/11
Final 2009 Report-Revised 08/02/10
Final 2008 Report
Final 2007 Report
Final 2006 Report
Final 2005 Report
Final 2004 Report

Historic Baseline Data for Reportable Diseases

Questions? Contact Srijiti Seshadri, BRDHD Epidemiologist 270-781-8039 Ext. 164
### 2011 Year to Date Report of Reportable Disease - Region 4

**Srihari Seshadri, Regional Epidemiologist, (270) 781-8039 ext 164**

**January 1, 2011 to December 31, 2011**

<table>
<thead>
<tr>
<th>Name of the Disease</th>
<th>Allen</th>
<th>Barren</th>
<th>Butler</th>
<th>Edmonson</th>
<th>Hart</th>
<th>Logan</th>
<th>Metcalfe</th>
<th>Monroe</th>
<th>Simpson</th>
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<td>Salmonellosis</td>
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<td>11</td>
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<td>15</td>
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Poster Presentation:
7th Annual OutBreak Net Conference: Long Beach, CA

Outbreak Investigation of Human *Salmonella* Enteritidis Infection:
Using Geographic Information System (GIS) and Pulsed Field Gel Electrophoresis (PFGE) Uploaded to PulseNet

Robert “Chip” Kraus III, BS; Srilhari Seshadri, MBBS, MPH
Barren River District Health Department

**Introduction**

The Barren River District Health Department (BRDHD) serves an eight county area in South Central Kentucky. Through an active partnership with local medical providers, the BRDHD Communicable Disease Team (CD Team) is able to maintain a baseline for reportable diseases. This investigation was conducted in Hart County, a rural farming community with a population of 18,199.

For February, 2011 six cases of Human *Salmonella* Enteritidis were confirmed. With accurate baseline data, we were able to use Geographic Information Systems (GIS), and Pulsed Field Gel Electrophoresis (PFGE) to confirm an outbreak.

**Geographic Area**

Barren River Health District

**Methods and Materials**

The BRDHD Epidemiologist maintains a reportable disease database for our health district in order to identify any unusual situations. As part of our routine investigation the CD Team reviewed medical records of confirmed cases and conducted telephone interviews. The information was tabulated into Excel and analyzed using Epi Info. We used ESRI’s ArcView 9.3 GIS software to compare case locations with natural and manmade ground features including surface water, water treatment plants, waterlines, etc. PFGE lab testing was performed by the Kentucky Division of Laboratory Services.

**Results**

This outbreak was initially identified as a typical cluster, but after GIS analysis revealed geographic proximity of the cases, further analysis was performed. The Kentucky Division of Laboratory Services identified eight cases of *Salmonella* Enteritidis with a Pulsed Field Gel Electrophoresis (PFGE) pattern matching the xbaI-pattern. Five cases were in Hart County, two in Barren County and one in Laure County, which borders Hart County.

**Conclusion**

This situation illustrates the importance of local health departments maintaining epidemiology capability, establishing baseline data on all reportable diseases, and working closely with their state lab.

Tools like GIS and PFGE can be used to identify relationships that are often overlooked. Disease investigators should correlate epidemiological investigation with laboratory findings and modern technology to assure a thorough investigation.

**References**

PFGE from Kentucky Division of Laboratory Services
Kentucky Reportable Disease Desk Reference
Aerial photography from Google Maps

**Acknowledgements**

Dr. Kraig E. Humbaugh, MD, MPH, State Epidemiologist
Dr. Robert L. Brawley, MD, MPH, FSEIA, Chief, Infectious Disease
Sandy E. Kelly, RN, MS, Nurse Service Administrator
Tracy L. Vaughan, R.N, Nurse Consultant,
Dr. Joshua Tobias, Ph.D., Laboratory Scientist II
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Laura Iwag, MPH, Epidemiologist I
Teresa Casey, BSN, R.N., Nurse Program Manager
Sharon Ray, R.N., Public Health Nurse
Megan Davidson, BSN, R.N., Public Health Nurse
Carolyn Lyons, BSN, R.N., Public Health Nurse
Tina Loy, R.N., Public Health Nurse
Beth Siddens, Health Planner

**Contact Information**

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www.BarrenRiverHealth.org
(270) 781-8039

Robert “Chip” Kraus Robert.l.kraus@ky.gov Ext. 185
Srilhari Seshadri Srilhari.seshadri@ky.gov Ext. 164
A New Outbreak Investigation
January-February 2012

Monroe County
<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Date of Specimen collection</th>
<th>Specimen Source</th>
<th>Collected at</th>
<th>Remarks</th>
<th>Local ID</th>
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<tbody>
<tr>
<td>8</td>
<td>F</td>
<td>1/23/2012</td>
<td>Stool</td>
<td>T.J. Samson Community Hosp</td>
<td>Isolate sent to KY State Lab for confirmation</td>
<td>OBS10204571KY01</td>
</tr>
<tr>
<td>32</td>
<td>M</td>
<td>1/23/2012</td>
<td>Blood</td>
<td>T.J. Samson Community Hosp</td>
<td>Isolate sent to KY State Lab for confirmation</td>
<td>OBS10204593KY01</td>
</tr>
<tr>
<td>40</td>
<td>F</td>
<td>1/20/2012</td>
<td>Stool</td>
<td>Monroe County Medical Center</td>
<td>Presumptive positive for Salmonella - sent to State Lab to confirm. This isolate (or specimen) was referred to your public health laboratory for additional testing and/or confirmation.</td>
<td>OBS10205034KY01</td>
</tr>
</tbody>
</table>
KY DPH to PFGE Lab (1/27/12)

- Positively identified 3 cases. Please initiate PFGE analysis asap to determine if these cases are a match due to potential outbreak
We did not wait for Serotyping

• Discussion with Monroe Co. HD nurses:
  ▫ Stressed the importance of completing the KY DPH Enteric Disease Investigation Form
  ▫ Encouraged them to ask questions related to travel, eating out (document name and location); parties, church activities etc.
Serotype Identified: January 31, 2012

- Serotype for the 2 specimens received by our DLS: *Salmonella Enteritidis*. 
Monroe Co. HD Nurses findings:  
January 31, 2012

- There were 2 cases that had eaten at the same restaurant 5 days prior to illness.
- The restaurant opened about a month ago and most everyone has been trying it out; it is packed pretty much every day.
Mexican Restaurant of Interest

- Environmental Inspection and follow up
  - New restaurant
  - Owner resident of TN
  - Fresh produce procured from TN and delivered every Wednesday.
  - They purchase fresh onion, tomato, avocado, jalapeno, pepper, lettuce, lemons, cilantro and pinto beans from this company
Monroe Co. HD Nurses findings: February 2, 2012

- Nurse interviewed the 5th suspected case: nothing suspicious and no connections with the other cases
- This client had only eaten at home
- A lot of talk about a “virus” going around, spoken to others that had similar symptoms but did not seek medical care
- The commonalities are chicken, lettuce, tomato, etc. but the grocery store varied with each of them
Feedback from KY & AL PFGE lab: Feb 3, 2012 (Friday)

- KY PFGE Lab: 2 of them are 100% match
- AL PFGE Lab:
  - The isolate is an Enteritidis and is a 100% match to pattern JEGX01.0005 in AL database.
  - The isolate from Celina, TN has the same pattern
Is Celina, TN close to cases in KY?
Case Cluster Map from EPI INFO 7
Outbreaks almost always happen on Friday afternoon...
KY Food Safety Branch Notified: February 6, 2012 (Monday)

... or sometimes, first thing Monday morning.
Feedback from TN Dept. of Health: February 6, 2012 (Monday)

- *S. Enteritidis 0005* is a common pattern in TN
- Since January 1st they had 3 cases with SE 0005.
- The cases are from
  - Davidson Co (Nashville)
  - Lincoln Co. (Fayetteville)
  - Shelby Co. (Memphis)
- Two of the three cases have been interviewed, and neither case mentioned eating at a Mexican restaurant
Increase in Salmonella cases in Barren County: Mid Feb 2012

Monroe County cases had consumed food in Barren County Restaurant
The three Salmonella isolates that have been pulsed are a CDC confirmed Match, additionally these isolates are a match to an isolate from Hopkins County. This has been reported as a cluster to Pulsnet/CDC, as there is no national increase at this time it has been deemed local to KY. We are continuing to monitor, if the 3 other isolates match these, the status may change.
Friday, February 24, 2012

- Notified by Minnesota DPH coincidentally they have a chicken breast isolate that matches Barren County’s *S. Enteritidis* pattern JEGX01.0034
<table>
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<th>County</th>
<th>Age</th>
<th>Sex</th>
<th>Date of Onset</th>
<th>Date of Collection</th>
<th>Hospitalized</th>
<th>Serogroup</th>
<th>PFGE pattern</th>
<th>Lab</th>
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<tbody>
<tr>
<td>Monroe</td>
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Conclusions & Recommendations/
Acknowledgements
Conclusion

• Routine Public Health Surveillance was key

• With the help of tools like GIS and PFGE we were able to conclude it was an outbreak

• This also illustrates the importance of LHDs maintaining epi capability and working closely with Reportable Disease Section and State lab.
Take home messages

• Maintain accurate baseline data.
• Anything above baseline generally needs further investigation.
• Modern technology can be useful during outbreak investigations (but don’t totally rely on them).
• Disease investigators need to correlate epi investigative findings with lab findings.
• Communication is important before, during and after an outbreak.
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Questions

Thanks!