Mississippi State Department of Health

Mississippi Morbidity Report

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Escherichia coli O157:H7 Outbreak in Public Health District IV

Introduction: In November 2010 the Mississippi State Department of Health (MSDH) investigated a cluster of *Escherichia coli* (*E. coli*) O157:H7/HUS cases in the Tombigbee Public Health District IV (Starkville/Columbus area). The initial report indicated that three siblings were hospitalized with hemolytic uremic syndrome (HUS) and that several other family members were also ill with a diarrheal illness. The investigation identified thirteen confirmed and probable cases of *E. coli* O15:H7/HUS in a close knit family living in three separate households. While no single point source for the infections was identified, two households were located on property with a failed onsite wastewater system and the investigation further revealed limited access to soap and water and minimal understanding of basic hygiene and sanitation, likely contributing to person to person transmission. A brief report of the investigation follows.

Background: On November 14, 2010 the MSDH Office of Epidemiology received a report that three siblings (twins aged three years, and a younger sibling aged two years) had been transferred from a north Mississippi hospital to hospitals in central Mississippi and northern Alabama with acute renal failure, bloody diarrhea, dehydration, and possible HUS. Additionally, two other siblings were hospitalized with vomiting and diarrhea and another two siblings were treated and discharged home from the emergency room with complaints of nausea, vomiting, abdominal cramps, and diarrhea. Other family members in two other households were also reportedly ill.

The siblings are part of a ten member family (household A) comprised of two adults and eight children (age range six months to eight years). Households B and C, located about one fourth of a mile away from household A, are on a small piece of property where a total of six homes share a sewage system. Household B is made up of two adults and two children, aged six weeks and 14 months. Household C is made up of a two adults and three children aged 19 months, three and six years of age. The children in the three households in this close-knit family are not in daycare, and frequently spend time in both household B and C, with an adult in household B and older children often caring for younger siblings and cousins.

Of note, the site of households B and C were inspected by MSDH environmentalists in February 2010 in response to a neighbor complaint about sewage run off. The initial inspection indicated that an onsite wastewater system had failed, and the occupants were given a notice of violation. However, no off site sewage discharge was noted at that time.

Methods: To further define the extent of the outbreak contact information for the family members in the three households was obtained, and family members were interviewed for symptoms, food history and common activities. Local area hospitals were contacted to determine if there were increased numbers of patients presenting with similar symptoms.

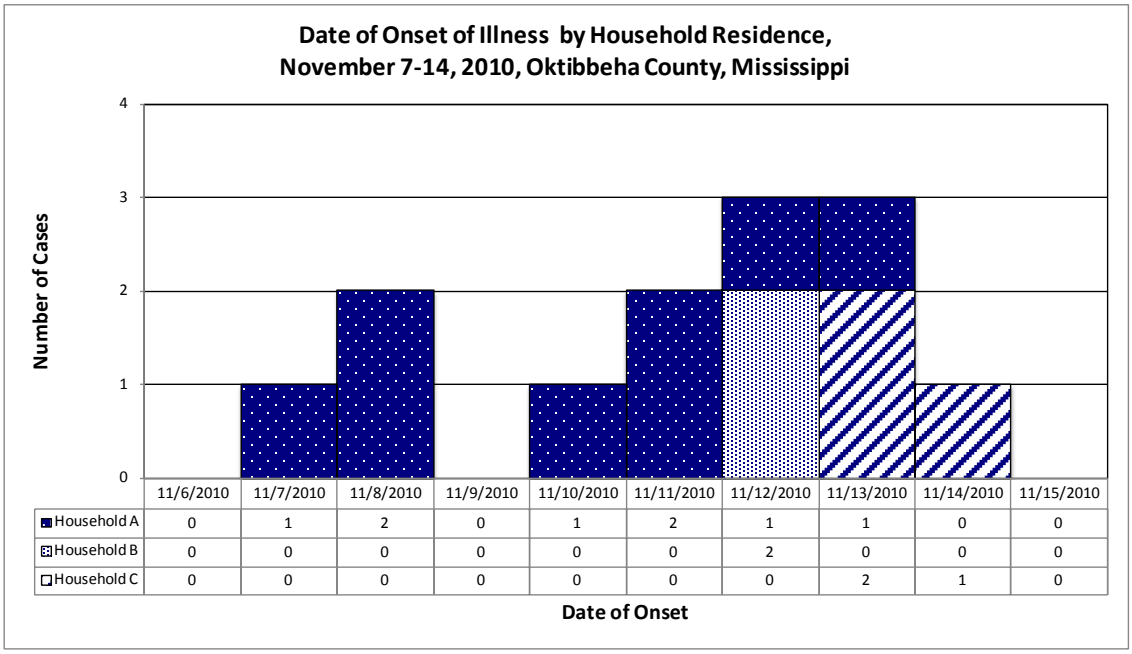
Stool samples were obtained from five symptomatic children in household A, an adult and an asymptomatic child in household B, and three symptomatic children in household C. The samples were submitted to the Mississippi Public Health Laboratory (PHL) for culture. Positive cultures were further analyzed by pulsed-field gel electrophoresis (PFGE). Additionally, MSDH asked the hospitals to submit any available isolates from the children with HUS for further evaluation at the PHL.

An assessment to evaluate environmental conditions within households A, B and C was done. An environmental site investigation of the property where household B and C are located was also conducted to re-evaluate the failed wastewater system first identified in February 2010.

Case Definition: A case was defined as anyone associated with the three households and with HUS or laboratory confirmed *E. coli* O157:H7 during the first two weeks of November 2010. A probable case was defined as anyone associated with the three households and with onset of diarrhea and/or vomiting during the same time frame, but with no laboratory confirmation, including those individuals with negative tests.

Results: Nineteen household members were interviewed for clinical symptoms, food histories and common activities. Nine confirmed and four probable cases were identified, with cases occurring in all three households. The cases ranged in age from 6 months to 57 years (the only adult case) with a median age of three years. In household A, which has ten individuals, all eight children were cases. In household B, which has four persons, an adult and a one year old child were cases, and in household C, which has five members, all three children were cases. The predominant symptoms were vomiting (92%), diarrhea (92%), abdominal cramps (69%) and bloody stools (23%). The onset of illness ranged from November 7 to November 14 (Figure). A total of five individuals were hospitalized, three with HUS. Local hospital and physician surveillance identified no additional cases. While all of the families are closely related and share frequent contact with each other, only one common meal was identified as having been shared by all members in late October, but parents were unable to reliably recall food histories.

Figure



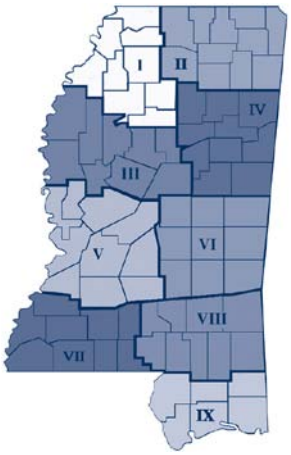
Six of the submitted stool samples were culture positive for *E. coli* O157:H7 (at least one positive culture in each household). PFGE analysis identified three distinct patterns, with breakdown by household noted in the Table below. The environmental assessments within the households indicated there was a lack of basic sanitation.

Table

	Household		
	A	B	C
Pattern 1	1	1	0
Pattern 2	1	0	1
Pattern 3	0	1	0

In household B, where the children from each household routinely spent time, there was no faucet on the kitchen sink; a bathtub was the only access to running water. Dishes were routinely rinsed in the bathtub and there was no soap for hand washing available in the household. Children were often responsible changing younger children's soiled diapers and were not given adequate hand washing instructions.

On the property where households B and C are located, six dwellings (five mobile homes and one constructed house) were observed, and all six appeared to be occupied. Onsite wastewater system failure was noted at this site in the form of a pool of untreated sewage located at the edge of the property line contained in what appeared to be an excavated area with a small berm. At the time of the inspection, no sewage appeared to be discharging off the property, however, due to the proximity to the property line, periodic off premise discharge is likely.



Mississippi
Provisional Reportable Disease Statistics
February 2011

		Public Health District									State Totals*			
		I	II	III	IV	V	VI	VII	VIII	IX	Feb 2011	Feb 2010	YTD 2011	YTD 2010
Sexually Transmitted Diseases	**Primary & Secondary Syphilis**	0	0	0	3	2	1	1	3	1	11	17	15	19
	Total Early Syphilis	2	0	2	4	16	3	2	5	8	42	42	55	46
	Gonorrhea	43	30	40	40	112	36	19	39	50	409	429	786	863
	Chlamydia	214	149	198	111	409	123	97	151	190	1,642	1,678	2,953	3,110
	HIV Disease	4	3	6	4	18	3	2	5	3	48	57	95	87
Myco-bacterial Diseases	**Pulmonary Tuberculosis (TB)**	0	2	1	1	5	1	0	1	1	12	3	12	7
	Extrapulmonary TB	0	0	0	0	0	0	0	0	0	0	0	1	1
	Mycobacteria Other Than TB	1	1	2	3	10	5	2	3	3	30	32	59	62
Vaccine Preventable Diseases	**Diphtheria**	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pertussis	0	0	0	0	0	0	0	0	0	0	7	1	11
	Tetanus	0	0	0	0	0	0	0	0	0	0	0	0	0
	Poliomyelitis	0	0	0	0	0	0	0	0	0	0	0	0	0
	Measles	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mumps	0	0	0	1	0	0	0	0	0	1	0	2	0
	Hepatitis B (acute)	0	1	0	0	0	0	0	0	0	1	4	2	5
	Invasive *H. influenzae* b disease	0	0	0	0	0	0	0	1	0	1	0	1	0
	Invasive Meningococcal disease	0	0	0	0	0	0	0	0	0	0	1	1	1
Enteric Diseases	**Hepatitis A (acute)**	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salmonellosis	0	1	0	2	0	3	1	0	3	10	18	45	39
	Shigellosis	0	2	0	0	0	2	0	0	0	4	0	9	1
	Campylobacteriosis	0	1	0	0	1	0	0	1	0	3	4	8	15
	E. coli O157:H7/HUS	0	0	0	0	0	0	0	0	0	0	1	0	1
Zoonotic Diseases	**Animal Rabies (bats)**	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lyme disease	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rocky Mountain spotted fever	0	0	0	0	0	0	0	0	0	0	0	0	0
	West Nile virus	0	0	0	0	0	0	0	0	0	0	0	0	1

* Totals include reports from Department of Corrections and those not reported from a specific District.

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Soil analyses indicated the area is unsuitable for underground absorption type systems, so any repair would require installation of mechanical systems, and additional space for a disposal area. Useable space to replace or repair an onsite system at this site is extremely limited due to the number of dwellings on the small property.

Summary: An outbreak of *E. coli* O157:H7 infection occurred among thirteen family members in November 2010. The family members are part of an extended close knit group made up of six adults and thirteen children in three separate households located on two separate pieces of property. Two of the households (B and C) are located on property with multiple dwellings and a failed wastewater system and pooled untreated sewage. Household B, where the children ranging from six weeks to eight years of age are typically cared for during the day, was noted to have limited access to running water, no available soap and the children were not given hand washing instructions. The only ill adult was the primary care giver at household B, and all of the children in this family were ill except the six week old.

Stool samples from six ill individuals were positive for *E. coli* O157:H7 and PFGE analyses demonstrated three distinct but closely related patterns indicating that the bacteria causing the illnesses were three different strains. Mixed outbreaks caused by multiple strains are often the result of non-point source contamination, such as sewage run-off. While the pooled sewage was not a new finding, it is possibly the source of the initial contamination followed by person to person transmission.

The CDC issued two reports in 1999 that outlined public health achievements and listed the control of infectious diseases as one of the ten great achievements of the 20th century. One of the most important ways this was accomplished was through improved sanitation and hygiene to prevent infection by providing clean drinking water, proper sewage disposal and education regarding proper food handling and hand washing. In places where safe sewage disposal does not occur, persons exposed are at risk for diseases that can cause severe illness and even death, such as E. coli O157:H7.

References available on request.

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