



Salmonellosis

Salmonellosis is a bacterial enteric disease caused by *Salmonella species* of which over 2,000 serotypes are known to infect humans. In person-to-person transmission, the transmission is fecal-oral. The number of organisms per gram of stool shed is highest during the acute clinical stage while diarrhea is present and is greatly reduced once the patient has formed stools. Bacteria may continue to be shed at low levels for weeks to months in rare instances.

Clinically, most cases will have an onset of symptoms in 12-36 hours following exposure, but the incubation period may range from less than a day to over a week following exposure. Most cases are uncomplicated and resolve without treatment other than rehydration and medication for symptoms. The illness can be more severe in some cases and deaths do occur, although rare. Individuals with achlorhydria, who have had gastrointestinal surgery, malignancies or who are immunocompromised are more susceptible if exposed and severity is more likely to be worse in the very young, the elderly and immunodeficient individuals. The incubation period, and possibly severity, may be tied to the amount of inocula ingested.

Salmonella spp. may also be spread by common source routes such as contaminated food and water supplies or exposure to animals, including household pets, livestock, poultry, birds, rodents and numerous species of reptiles and amphibians. When *Salmonella spp.* are responsible for outbreaks, the cases can be localized in a community or scattered over large areas of the country from widely distributed interstate commerce channels. While localized outbreaks will usually be detected, interstate outbreaks are more difficult to detect. Thanks to advances in national surveillance and laboratory speciation techniques down to the molecular level, these types of occurrences are detected faster and more often than in the past. Once a potential problem is detected, appropriate epidemiologic investigations and enforcement actions among cooperating local, state and federal agencies responsible for food safety can be initiated to help identify a contaminated product. Trace backs and recalls can be initiated and public information about the product and prevention can be provided.

Specific diagnosis requires a stool culture. Many, if not most, uncomplicated and milder cases will not need to seek medical care and will go undiagnosed as the symptoms will resolve on their own in a matter of days. If enteric diseases are known to be occurring in the area or the case has more severe symptoms, the clinician's index of suspicion may be higher and result in a stool sample obtained for culturing. Since most health care providers will typically see some background amount of gastrointestinal illnesses, they may or may not routinely order workups. Most clinical and hospital laboratories typically do not characterize *Salmonella* beyond biochemical grouping level. The MSDH requests that all isolates be submitted to the Public Health Laboratory for full characterization. Having full knowledge of the organism, including serotype and pulse field gel electrophoresis (PFGE) pattern is critical for surveillance and will help differentiate the sporadic community acquired person-to-person background cases from potential outbreaks.

Surveillance Challenges

Under the *Rules and Regulations for Reportable Diseases and Conditions*, individual cases of salmonellosis in Mississippi are Class 2 reportable events to be reported "within 1 week of diagnosis." All positive *Salmonella* cultures are also to be reported by laboratories "at least weekly." If clinically compatible cases, whether confirmed or not, are thought to be part of or associated with an outbreak, they should be handled as a Class I condition and reported "within 24 hours of first knowledge or suspicion." If part of an outbreak, the earlier the notification is made, the sooner investigative steps can begin to determine its source, and control measures can be implemented. Many reported potential outbreaks prove not to be real, but a few are and early notification can prevent additional cases. The following will give some examples of where astute

clinicians and laboratorians have greatly assisted in detecting moderate to very large *Salmonella* outbreaks in the state that could otherwise have gone undetected. The last example is one in where a higher index of suspicion could have helped curb an outbreak.

In 1986, the laboratory director of a moderate sized hospital detected a possible salmonellosis problem in their service area. The director had noticed an increase in the number of stool culture requests and reviewed the submission slips. Several of the patients were from the same general area; however, most of physicians in the area had seen no more than one or two cases and so did not notice a problem. The laboratory director called the MSDH to report their concern. It was rapidly learned a small community water supply provided service to the area where the cases were located. After investigation it was found the system's unprotected wellhead had been flooded during a rain event that also flooded the community sewer system that ran close to the well. Cultures from patients and the water supply matched. Corrective and preventive measures were taken and the problem was resolved. This infectious disease outbreak is the only one in 60 or more years to be traced to a public water supply in the state.

In April, 1995, a large Mississippi university student health director and physician called the Office of Epidemiology to report what might be a salmonellosis outbreak that occurred as part of a weekend campus special event. Patients seen in the clinic had consumed bar-b-que at the one day event. Investigation revealed that some of the bar-b-que prepared by numerous parties may not have been adequately cooked or had been contaminated after cooking. At least 75 culture confirmed cases were found but the actual scope of the outbreak was probably much larger. More importantly, many potential cases were prevented as a large number of persons had purchased bar-b-que to take home. Several press releases were issued warning participants throughout the state not to consume the bar-b-que and dispose of it. Several bar-b-que samples were obtained from those who had purchased the meals, and many of the samples were positive for the same serotype.

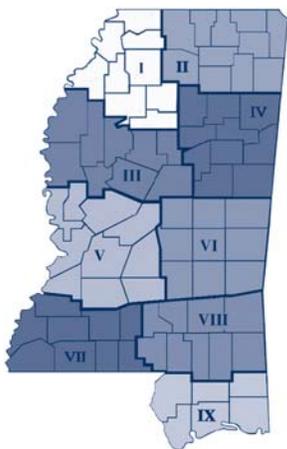
In late 2011 a large salmonellaosis outbreak occurred and was traced to a restaurant in Northeast Mississippi. At least 160 known cases, including numerous food handlers, were known to have occurred. An environmental investigation of the suspect facility and case finding activities began within an hour of the local health department receiving the first complaint and confirming a case. Once additional cases were found and initially linked to the facility the restaurant voluntarily closed while a full investigation was conducted to identify any specific risks. No facilities served by the same food supply distributors and wholesalers were found to have associated cases. The restaurant involved was one of several managed by the same group and none of the other outlets had associated cases. Based on initial findings, the possible source(s) could have been within the one facility and stool samples were requested on all employees. A number of food samples were also collected for culture. *S. Typhimurium* was identified in a number of cases and employees while all food samples were negative. PFGE conducted by the Public Health Laboratory confirmed that isolates from diners and workers were identical. Sixty percent of the employees had positive cultures.

The menu from the restaurant was obtained and a food specific questionnaire developed. Names from credit or debit card receipts were used in case finding and to locate persons who had eaten in the restaurant but did not become ill, to serve as controls. The questionnaire was administered to 200 individuals (144 cases and 56 controls) that had eaten at the restaurant during the specified time period of concern. Only one food item showed a statistical association with illness but this may be a spurious result as 84% of all diners, ill and not ill, had eaten the item. The most likely factor contributing to illnesses was the numerous infected food handlers. Prior to returning to work, all food workers were required to have two negative stool cultures. The restaurant cooperated fully with the MSDH investigation. After additional training and cleaning, it was allowed to reopen and no additional problems have been reported.

Mississippi

Provisional Reportable Disease Statistics

December 2011



		Public Health District									State Totals*			
		I	II	III	IV	V	VI	VII	VIII	IX	Dec 2011	Dec 2010	YTD 2011	YTD 2010
Sexually Transmitted Diseases	Primary & Secondary Syphilis	-	-	-	-	-	-	-	-	-	†	26	†	225
	Total Early Syphilis	-	-	-	-	-	-	-	-	-	†	75	†	618
	Gonorrhea	-	-	-	-	-	-	-	-	-	†	579	†	6,196
	Chlamydia	-	-	-	-	-	-	-	-	-	†	1,809	†	21,422
	HIV Disease	-	-	-	-	-	-	-	-	-	†	44	†	554
Mycobacterial Diseases	Pulmonary Tuberculosis (TB)	0	0	0	0	5	0	2	0	2	9	11	72	101
	Extrapulmonary TB	1	0	0	0	0	0	0	0	0	1	5	14	15
	Mycobacteria Other Than TB	3	3	1	0	7	6	1	1	1	23	24	331	386
Vaccine Preventable Diseases	Diphtheria	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pertussis	0	0	0	0	2	0	0	0	0	2	5	46	106
	Tetanus	0	0	0	0	0	0	0	0	0	0	0	1	0
	Polioyelitis	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	0	0	0	0	0	0	0	0	3	0
	Hepatitis B (acute)	0	0	0	0	0	0	0	2	0	2	2	49	34
	Invasive <i>H. influenzae</i> b disease	0	0	0	0	0	0	0	0	0	0	0	3	0
	Invasive Meningococcal disease	0	0	0	0	0	0	0	0	0	0	0	4	5
Enteric Diseases	Hepatitis A (acute)	0	0	0	0	0	0	0	0	0	0	0	7	2
	Salmonellosis	4	101	0	2	11	1	4	6	5	134	47	1440	1213
	Shigellosis	1	1	0	0	17	0	0	0	2	21	7	239	60
	Campylobacteriosis	1	0	0	0	0	0	0	2	1	4	3	71	128
	<i>E. coli</i> O157:H7/HUS	0	1	0	0	1	2	0	0	0	4	0	15	24
Zoonotic Diseases	Animal Rabies (bats)	0	0	0	0	0	0	0	0	0	0	0	2	0
	Lyme disease	0	0	0	0	0	0	0	0	0	0	0	3	0
	Rocky Mountain spotted fever	0	0	0	0	0	0	0	0	0	0	1	19	27
	West Nile virus	0	0	0	0	0	0	0	0	0	0	0	52	8

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

†Data not available.

The investigation revealed transmission was in the 8th day before the first customer complaint was received. It is estimated that at least 25% of the patients had sought medical care before the MSDH received the first report or complaint. The largest barrier to early suspicion, and hence reporting and detection, relates to no one health care provider seeing more than a few of the patients and these patients may be scattered over several days. As noted earlier, most clinicians expect to see some level of GI illness in their day to day patient load. Had a large number presented to just a few providers or in a temporally compact timeframe, in all likelihood alarms would have gone off. In retrospect, given the dates of exposure, it is estimated the number of cases could have been reduced had the situation been made known 2-3 days earlier. Only three of the 160 or more cases were known to have been potentially exposed once the MSDH was notified and intervention began. While all case and laboratory reports were made as required, the last example illustrates that improvements in reporting could have real public and personal health impact. Future discussions are planned with the medical and laboratory community at large to learn how surveillance in similar situations can be improved. The best advice to clinicians and laboratories is: if in doubt, report.

Submitted by Bruce Brackin, Epidemiology Consultant and Sheryl Hand, RN Nurse Epidemiologist, MSDH

To report any suspected outbreak to the MSDH during normal business hours
Call **601-576-7725** or
1-800-556-0003

After Hours, Holidays and weekends
Call **601-576-7400**

New Reportable Disease cards are available by request during normal business hours