

Multistate Outbreaks of *Salmonella* Sandiego and *Salmonella* Poona Infections Linked to Small Turtles — United States, 2015

Kelly J. Gambino-Shirley, DVM, MPH¹, Lauren M. Stevenson, MHS¹, Katherine Wargo, MPH, CHES¹, Laura Burnworth, MPH¹, Jonathan L. Roberts, DVM², Nancy Garrett, BS¹, Susan Van Duyne, BA,BS, MA¹, Gillian McAllister, BS¹, and Megin C. Nichols, DVM, MPH, DACVPM¹

¹Centers for Disease Control and Prevention, Atlanta, Georgia ²Louisiana Department of Agriculture and Forestry, Baton Rouge, Louisiana

BACKGROUND

Salmonella

- Zoonotic transmission of *Salmonella* causes an estimated 11% of salmonellosis in the United States
- Normal gut flora for a variety of animals including reptiles
- Human infections occur through direct contact with the reptile or indirect contact by touching contaminated environments

Turtles

- 1960–1974 — Popular household pets that caused an estimated 14% of human *Salmonella* infections annually
- In 1975, the FDA banned the sale of turtles with a shell length of less than four inches

Turtle-Associated Salmonellosis Outbreaks

- 2011–2013 — Eight multistate outbreaks with 473 persons infected with multiple strains of *Salmonella* serotypes Sandiego, Poona, and Pomona
- Investigation of these outbreaks identified two turtle farms in Louisiana as the source of some of the small turtles

OUTBREAK DETECTION

August 1, 2015

United States Food and Drug Administration (FDA) notified CDC of a consumer complaint involving transmission of *Salmonella* Sandiego to a child from a small turtle. PulseNet identified four multistate *Salmonella* outbreaks: two *Salmonella* Sandiego and two *Salmonella* Poona

OBJECTIVES

- Examine characteristics of ill persons
- Investigate if these strains of *Salmonella* related to 2011–2013 *Salmonella* Sandiego and *Salmonella* Poona outbreak strains
- Develop public health recommendations

METHODS

Epidemiologic Investigation

- State and local health department interviewed ill persons with routine enteric questionnaire
- Turtle supplemental questionnaire administered
- Binomial probability of reptile exposure compared against expected reptile ownership as reported by the American Pet Products Association*

Laboratory Investigation

- Turtle and environmental samples collected from ill persons' homes
- Environmental samples collected from a Louisiana turtle farm
- Samples yielding *Salmonella* serotyped and subtyped by pulse-field gel electrophoresis (PFGE) using enzyme *Xba*I
- Whole genome sequencing (WGS) performed to characterize genetic relatedness of the isolates

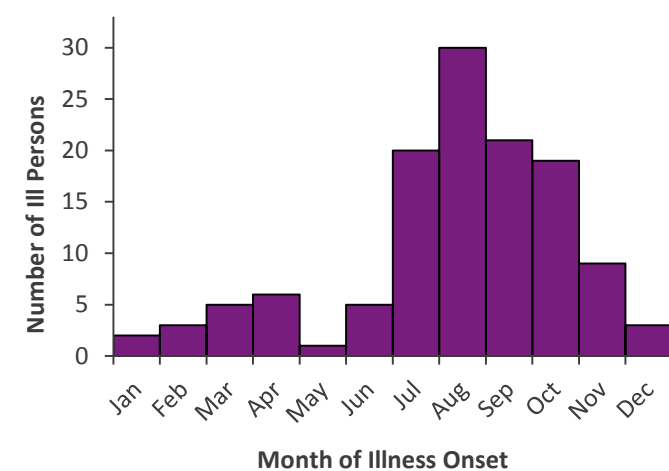
Traceback Investigation

- Turtle purchase information collected from ill persons

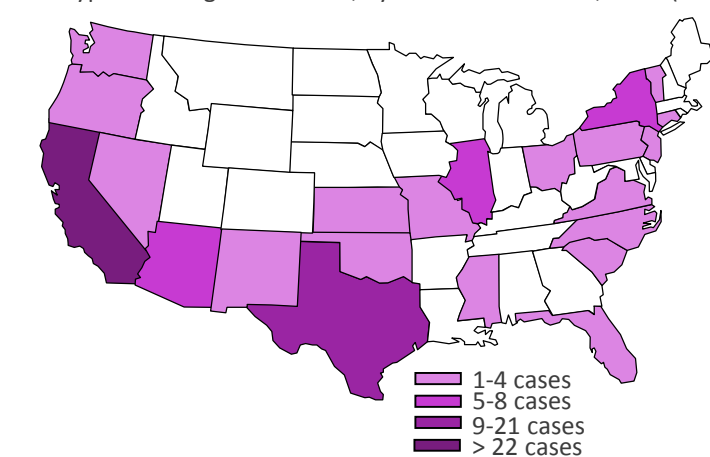
RESULTS

Outbreak Summary

Number of Ill Persons Infected with *Salmonella* Serotype Sandiego or Poona by Month of Illness Onset — United States, 2015 (n=124)



Ill Persons Infected with the Outbreak Strains of *Salmonella* Serotypes Sandiego and Poona, by State of Residence, 2015 (n=124)



Characteristics of Ill Persons with the Outbreak Strains of *Salmonella* Serotype Sandiego or Poona (n=124)

Characteristic	n (%)
Median age (range)	7 years (<1 to 82)
<5 years	51 (41%)
Female	59 (48%)
Hispanic (n=83)	58 (70%)
Hospitalizations (n=108)	36 (33%)
Deaths	0 (0%)

Exposure Summary

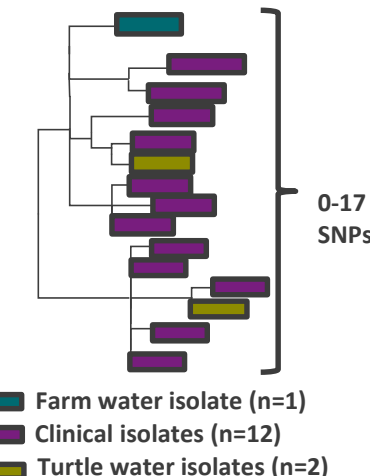
Reported Reptile Exposures of Ill Persons Infected with the Outbreak Strains of *Salmonella* Serotype Sandiego or Poona (n=104)

Reptile	n (%)
Any Reptile	51 (49%)*
Small Turtles	50 (98%)
Bearded dragon	1 (2%)

- Observed reptile exposure significantly higher than expected reptile exposure (4.9%) as reported in the 2015–2016 National Pet Owners Survey by American Pet Products Association*

Laboratory Summary

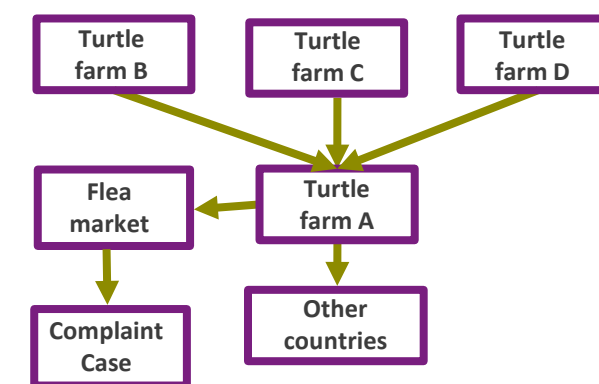
- Turtle and turtle environment samples collected from ill persons' homes cultured positive for *Salmonella*
 - Seventeen isolates matched the outbreak strains
 - Two isolates were *Salmonella* Paratyphi B var L-tartrate+
 - Two isolates were *Salmonella* Pomona
- WGS performed* to characterize the genetic relatedness of the Louisiana turtle farm water isolate linked to the 2011–2013 outbreaks, clinical isolates, and turtle water isolates collected from ill persons' homes
- Analysis revealed the farm water, clinical, and turtle water isolates are closely related



*CDC Enteric Disease Laboratory Branch
SNP = single nucleotide polymorphism

Traceback Summary

- Thirty-four (68%) of 50 ill persons with turtle exposure provided information on how they acquired the small turtle
 - Twenty-four (71%) of the 34 purchased the small turtle
 - Thirteen (54%) of the 24 purchased from a flea market or a street vendor
- Parent identified a flea market vendor in the complaint to FDA
 - FDA located the vendor, and the vendor identified turtle farm A as the supplier
- Pond water samples from turtle farm A yielded cultures of *Salmonella* serotypes Pomona, Berta, and Braenderup
 - Did not yield the outbreak strains
 - Salmonella* Pomona isolates from pond water matched isolates from an ill person's pet turtle's environment
- Turtle farm A includes turtles from three other turtle farms (B–D)
 - Pond water samples from turtle farms B–D yielded cultures for many *Salmonella* subspecies but not the outbreak strains
- Turtle farm A exports to many other countries that include countries reporting human *Salmonella* infections linked to small turtles



CONCLUSION

- Small turtles linked to the multistate outbreaks of *Salmonella* infections
- Higher frequency of illness
 - Children aged <5 years
 - Persons reporting Hispanic ethnicity
- Turtle farm A
 - Likely source of small turtles linked to illness domestically and internationally
 - Implicated in 2011–2013 outbreaks linked to small turtles

RECOMMENDATIONS

- Education is needed to address the risk to children of *Salmonella* infections from small turtles and other reptiles
- Translate and disseminate effective messaging on safe handling practices of pet reptiles into Spanish
- Enforce existing regulations banning the sale of small turtles to prevent turtle-associated *Salmonella* infections

PUBLIC HEALTH ACTION

- Alerted international communities with a WHO Disease Outbreak News posting



ACKNOWLEDGEMENTS

CDC: Outbreak Response and Prevention Branch, Enteric Diseases Laboratory Branch, PulseNet
 U.S. Department of Agriculture: APHIS, NVSL
 U.S. Food and Drug Administration: CVM, New Orleans District Office
 U.S. Fish and Wildlife Service
 Multiple state and local health departments, state department of agriculture

ADDITIONAL INFORMATION

Contact Kelly Gambino-Shirley, DVM, MPH, klo1@cdc.gov, 404-639-1461
 *2015-2016 American Pet Products Association National Pet Owners Survey

