



# *Salmonella typhi* infection in Los Angeles, California with no known infectious source: a case report

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**Abstract:** Typhoid fever, caused by *Salmonella typhi* (*S. typhi*) is common in developing countries with limited access to sanitation. In the United States, such infections almost exclusively occur in travelers returning from endemic countries or from outbreaks of contaminated food. We describe a patient who initially presented to an emergency department (ED) in Los Angeles, California with fever and headaches for several days along with neck stiffness, intermittent non-bloody diarrhea, and one episode of non-bloody, non-bilious emesis. An extensive workup was performed in the ED, including a lumbar puncture to rule out bacterial meningitis, which was negative. Urinalysis showed leukocyturia and bacteriuria, and the patient was discharged home with ciprofloxacin to treat a presumptive diagnosis of pyelonephritis. One day after discharge, the patient developed worsening symptoms and revisited the ED. By that time, the patient's blood cultures returned positive for *Enterobacteriaceae* that subsequently speciated to *S. typhi*, confirming the diagnosis of typhoid fever. The patient was successfully treated with ceftriaxone in the hospital and ciprofloxacin at home. Interestingly, the patient had no known infectious contact, and family members later tested negative for asymptomatic *Salmonella* shedding. Although community-acquired typhoid fever is rare in developed countries, such as the United States, our case demonstrates the importance for emergency physicians practicing in these settings to recognize and keep such infections in mind.

**Keywords:** *Salmonella typhi* infection (*S. typhi* infection); typhoid fever; Los Angeles, California; United States

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## Introduction

*Salmonella typhi* (*S. typhi*) causes typhoid fever, a life-threatening systemic illness that typically involves fever and abdominal pain (1). Typhoid fever commonly affects children and young adults (2) and is more prevalent in developing countries with limited access to sanitation (e.g., Southeast Asia, Southern Africa). In the United States, about 200 to 300 cases are reported yearly (3), with approximately 80% of them originating from travelers who visited endemic countries (4). Domestically, outbreaks tend to be foodborne with onset of symptoms 5 to 21 days after ingestion (4). Interestingly, we describe a patient living in Los Angeles, California who presented to the emergency

department (ED) with *S. typhi* with an unclear infectious source. We present the following case in accordance with the CARE reporting checklist (available at <http://dx.doi.org/10.21037/jeccm-21-3>).

## Case presentation

A 28-year-old female residing in Los Angeles, California with a history of prior urinary tract infections presented to the ED with intermittent headache for a week and fever for the past 5 days. The headache was refractory to acetaminophen and was exacerbated with movement. Her symptoms were associated with neck stiffness, intermittent non-bloody diarrhea, and one episode of non-bloody, non-

**Table 1** Vital signs from ED visits

Vital signs	Arrival of first ED visit	Admission from second ED visit
Oral temperature (°C)	39.5	39.2
Blood pressure (mmHg)	102/55	109/66
Heart rate (beats/min)	116	94
Respiratory rate (breaths/min)	18	16

ED, emergency department.

bilious emesis.

Two days prior to presentation, the patient went to urgent care and was prescribed nitrofurantoin despite the absence of urinary symptoms (e.g., suprapubic pain, dysuria, urinary changes). She denied cough, chest pain, shortness of breath, diarrhea, abdominal pain, confusion, blurry or double vision, or focal numbness or weakness. She had no known sick contacts, recent sexual activity, recent substance use, or recent travel. She mostly ate home-cooked food, with occasional takeout meals.

The patient was assessed in the ED, and pertinent vital signs and laboratory results are presented in *Tables 1,2*. A computed tomography of the head (CTH) and lumbar puncture were obtained to rule out meningitis, and the patient was empirically started on intravenous ceftriaxone, vancomycin, and acyclovir. The CTH was within normal limits, and the lumbar puncture was unremarkable. Urinalysis was notable for 11–30 white blood cells per high powered field and positive bacteria, and the patient was discharged home with ciprofloxacin 500 mg orally two times daily.

The day after ED discharge, the patient reported worsening fever and chills along with neck pain and lightheadedness, prompting her to return to the ED. By this time, two of two blood cultures drawn at the initial visit returned positive for *Enterobacteriaceae* that subsequently speciated to *S. typhi*.

Relevant vital signs and laboratory results from the second ED visit are found in *Tables 1,2*. She was febrile to 39.2 °C with a heart rate of 94 and reported headaches that were slightly better compared with her first ED visit. These headaches were not associated with changes in vision, dizziness, weakness, or photophobia, and the patient did not endorse any new symptoms from the first ED visit. She was subsequently admitted to Internal Medicine.

Given the patient's positive *S. typhi* blood cultures, headaches (5,6), diarrhea, relative bradycardia in the setting of fevers (7), elevated liver function tests (8), normal right

upper quadrant ultrasound ruling out biliary etiologies, and negative infectious workup from other organisms (e.g., COVID-19, hepatitis A, B, and C viruses, human immunodeficiency virus, syphilis, *Neisseria gonorrhoea*, or *Chlamydia trachomatis*), the patient was eventually diagnosed with *S. typhi* bacteremia (i.e., Typhoid fever) with an unclear infectious source and started on a 10-day course of intravenous ceftriaxone 2 g daily. The patient improved and repeat blood cultures were negative. She was later discharged on oral ciprofloxacin 500 mg twice daily to complete the antibiotic course along with a follow up appointment with her primary care provider. The case was reported to the Los Angeles County Department of Public Health, and her live-in family members subsequently tested negative for asymptomatic Salmonella shedding.

The timeline of the clinical course and fever pattern are outlined in *Figures 1,2* respectively.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient.

### Patient perspective

*“I initially went to the ED complaining of a massive headache and fever. My blood and spinal fluid were drawn, and I was prophylactically treated for meningitis. I had to get an MRI as well. My cerebrospinal fluid was clear, so meningitis was ruled out. I was later called back to the hospital due to the presence of Salmonella in my blood.*

*During my hospital stay, I was given intravenous medication and fluids. I barely had any appetite and was mostly in bed because I would feel extremely dizzy whenever I stood up. My migraine still persisted and only subsided during the last day of my stay.*

*During the length of my stay, daily blood samples were taken to check for bacterial growth. After 3 days, I was released when my blood sample was finally clear. My internal organs were checked*

**Table 2** Laboratory values

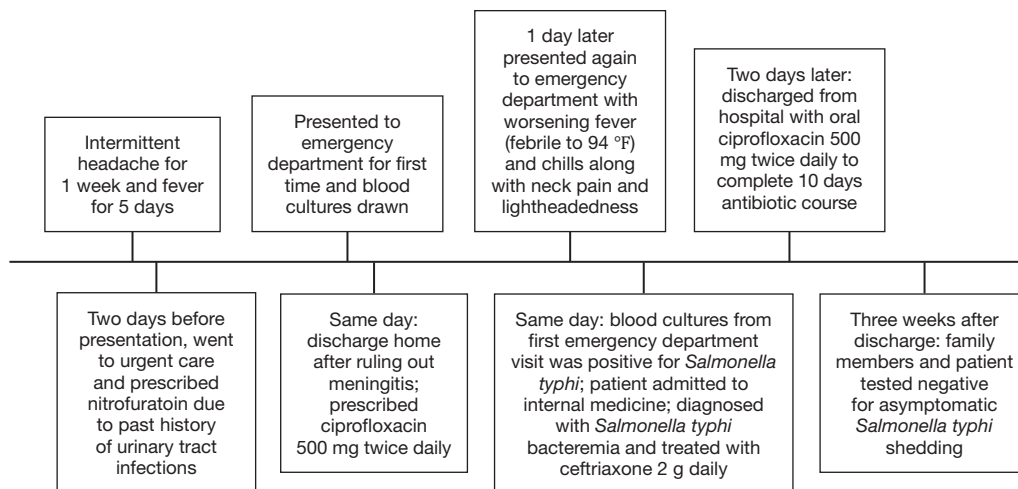
Laboratory values	Upon first ED visit	Upon second ED visit
Complete blood count		
White blood cell (K/cumm)	6.0	4.4 (low)
Red blood cell (M/cumm)	4.41	3.90
Hemoglobin (g/dL)	12.6	11.2 (low)
Hematocrit (%)	36.80	33 (low)
Mean corpuscular volume (fL)	83.3	84.4
Mean corpuscular hemoglobin (pg)	28.6	28.7
Mean corpuscular hemoglobin concentration (g/dL)	34.3	34.0
Red cell distribution width (%)	12.10	12.60
Platelet count (K/cumm)	166	152 (low)
Mean platelet volume (fL)	7.9	8.6
Basic metabolic panel		
Sodium (mmol/L)	132 (low)	136
Potassium (mmol/L)	3.6	3.7
Chloride (mmol/L)	96 (low)	102
Bicarbonate (mmol/L)	25	24
Anion gap (mmol/L)	11	10
Blood urea nitrogen (mg/dL)	8	<5 (low)
Creatinine (mg/dL)	0.72	0.51
Estimated glomerular filtration rate (mL/min)	114	131
Glucose (mg/dL)	115	104
Calcium (mg/dL)	8.0 (low)	7.6 (low)
Lactate (mmol/L)	1.2	1.2
Urinary analysis		
White blood cell count (/HPF)	11–30	4–10
Bacteria (/HPF)	Many	Few
Squamous epithelial cells (/LPF)	>30	>30
Cerebrospinal fluid studies		
Color	Colorless	
Red blood cell count (cells/ $\mu$ L)	32	
Nucleated cell count (cells/ $\mu$ L)	3	
Segmented neutrophils (%)	60	
Lymphocyte (%)	20	
Monocytes/histiocytes (%)	20	
Glucose (mg/dL)	65	
Protein (mg/dL)	15	

Table 2 (continued)

Table 2 (continued)

Laboratory values	Upon first ED visit	Upon second ED visit
Blood culture	2/2 positive for <i>S. typhi</i>	
Alkaline phosphatase (IU/L)		171
Aspartate transaminase (U/L)		125 (high)
Alanine aminotransferase (U/L)		97 (high)

ED, emergency department; *S. typhi*, *Salmonella typhi*.



**Figure 1** Timeline of the clinical course. The timeline highlights major events that occurred during the patient's clinical course.

via ultrasound. Thankfully I had no issues there. Upon discharge from the hospital, I was prescribed ciprofloxacin. Over the course of 3 weeks, the Los Angeles County Department of Public Health took urine and stool samples from my family and me. They took a sample per week: two from people in my household and three from me. Everything came out negative.”

## Discussion

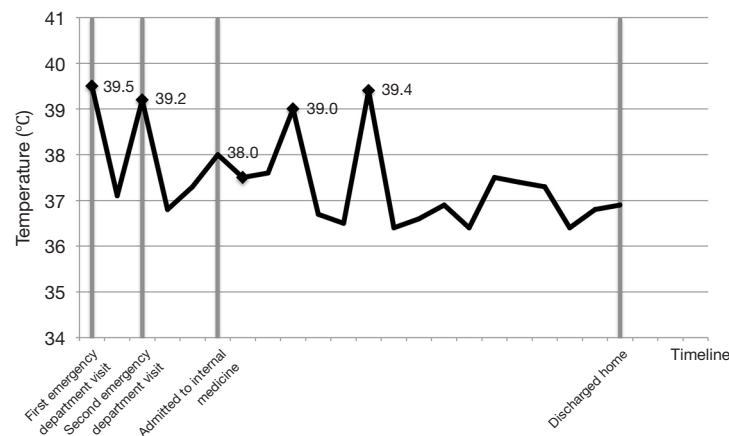
Although most cases of typhoid fever described in the literature take place in developing countries with traceable infectious origins, our patient displayed classic symptoms of typhoid fever in the United States without a known infectious source. The patient had rising “stepwise” fevers and bacteremia in the first week, coupled with headaches (5,6), diarrhea, relative bradycardia with fevers (i.e., sphygmothermic dissociation) (7), and elevated liver function tests (8) in the setting of positive *S. typhi* blood cultures. With untreated typhoid fever, patients may progress and develop abdominal pain, “rose spots” (i.e.,

faint salmon-colored macules predominately on the thorax and abdomen), as well as hepatosplenomegaly, intestinal bleeding, and perforation due to hyperplasia of Peyer's patches (3).

Fortunately, our patient did not display advanced symptoms of typhoid fever and improved after receiving antibiotic treatment. Prior to the development of antibiotics, patients had at least a 15% mortality rate, and 10% of those who did not receive treatment would relapse (7). In contrast, patients in the United States who received antibiotics had a mean case-fatality rate of 2% (9). Thus, antibiotics effectively treat such bacterial diseases.

Limitations in the diagnostic approach to our patient included non-specific systemic symptoms (e.g., fever, headache, diarrhea) upon initial presentation in the setting of an unknown infectious source in a developed country. Blood culture confirmation of *S. typhi* infection helped yield a final diagnosis in our patient.

Although community transmission of *S. typhi* infection in developed countries is rare, our case shows that such



**Figure 2** Fever pattern. The graph depicts the patient's fever pattern throughout the clinical course. Temperatures with markers denote antipyretic use.

occurrences are possible. Given antibiotics' effectiveness in treating *S. typhi* infections, it is important for emergency physicians practicing in developed countries to be aware of such cases in order to identify and treat them accordingly.

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### Footnote

*Reporting Checklist:* The authors have completed the CARE reporting checklist. Available at <http://dx.doi.org/10.21037/jecm-21-3>

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/jecm-21-3>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional

and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient. We believe our case has great educational value for clinicians.

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