



Case report

Turtle-associated salmonellosis due to *Salmonella* Litchfield in a 57-day-old infant: a case report

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Abstract

A 57-day-old boy presented with fever, watery diarrhea, and anorexia and was admitted with suspected acute gastroenteritis. His laboratory data suggested low-level inflammation and cholestasis. His stool culture was positive for *Salmonella* Litchfield. With suspicion of bacterial infection, the patient received intravenous ampicillin for 5 days. On the fifth day after admission, his inflammatory and cholestasis markers normalized, and he was discharged from the hospital in good condition. His family kept five Japanese pond turtles as pets for one year. As *Salmonella* Litchfield was isolated from a swab sample of the turtle's body. The patient was diagnosed with turtle-associated salmonellosis. In conclusion, families, particularly those with infants, should avoid keeping turtles in their homes. Pet shop owners and public health authorities must provide appropriate information regarding *Salmonella* in turtles.

Key words: turtle-associated salmonellosis, infant, *Salmonella* Litchfield, *Salmonella enterica*, Japanese pond turtle

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Introduction

Salmonellosis is frequently associated with the ingestion of contaminated foods of animal origin or contact with animals such as turtles and other reptiles, which are major reservoirs of *Salmonella*¹⁾. The number of pet reptiles has increased worldwide^{2, 3)}. *Salmonella* Litchfield, a serotype of *Salmonella enterica* subsp. *enterica*, is occasionally isolated from turtles⁴⁾.

To our knowledge, this is the first report from Japan of turtle-associated salmonellosis (TAS) in an infant younger than 2 months of age and the first report of salmonellosis associated with Japanese pond turtles.

Case Report

A 57-day-old boy presented to the hospital after experi-

encing fever and diarrhea for 2 days. The patient experienced fever (39.0°C), watery diarrhea (15 times a day), and anorexia. His stools were initially pale yellow and were later green, with and laced with some blood. He had no history of vomiting or respiratory symptoms. He was admitted with suspected acute gastroenteritis.

The patient was born at 34 weeks and 3 days of gestation, with a birth weight of 2,040 g. He was discharged from the hospital at a modified gestational age of 37 weeks and 20 days. He was breastfed.

On physical examination, the patient showed tachycardia of 190 beats per minute, no murmurs, 100% O₂ saturation, and stable breathing and circulation. His laboratory data included a white blood cell count of 3,800 /μL and C-reactive protein level of 2.06 mg/dL suggestive of low-level inflammation, a total bilirubin level of 4.06 mg/dL, a direct bilirubin level of 1.14 mg/dL, and an alkaline phosphatase level of 1,961 IU/L suggestive of cholestasis. Microbiological investigations including blood and urine cultures were negative, while a stool culture was positive for *Salmonella* Litchfield susceptible to ampicillin, ceftriaxone, and levofloxacin and resistant to cefazolin, cefmetazole, amikacin, and gentamicin.

With the suspicion of a bacterial infection, he received intravenous ampicillin for 5 days. On the third day after admission, his temperature returned to normal, and his diarrhea and anorexia improved. On the fourth day after ad-

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mission, *Salmonella* Litchfield was isolated from the fecal specimens collected at the time of admission, and he was diagnosed with salmonellosis. On the fifth day after admission, his inflammatory and cholestasis markers normalized and he was discharged from the hospital in good condition. However, his stool culture was still positive for *Salmonella* Litchfield 6 months after discharge.

The patient's family reported that they had been keeping five Japanese pond turtles as pets at their home for 1 year. The patient's father usually handled the turtles, while the other family members did not. The aquarium and related materials were routinely washed in the bathroom. As *Salmonella* Litchfield was isolated from a swab sample of the turtle's body, the patient was diagnosed with TAS. *Salmonella* was not isolated from the bathroom swab samples.

The patient's parents provided consent for the publication of this case report.

Discussion

Salmonellosis is a symptomatic infection caused by *Salmonella enterica*, which is classified into six subspecies. One of them, *S. enterica* subsp. *enterica*, constitutes the majority (99.5%) of isolates cultured from humans and other warm-blooded animals and contains the majority of disease-causing serovars⁵. *Salmonella* Litchfield is a major serotype of *S. enterica* subsp. *enterica*, which is occasionally isolated from turtles⁹. Outbreaks of *Salmonella* Litchfield have been reported in the United States, Europe, and Australia^{6–9}, while two cases of TAS due to *Salmonella* Litchfield have been reported in Japan^{10, 11}.

Infants and young children are more likely than the general population to become infected with *Salmonella* and are at greater risk of developing its complications, such as septicemia, meningitis, and death¹². Further, infants and young children also at an increased risk of developing TAS¹³. To prevent TAS among children, the United States Food and Drug Administration enacted a ban prohibiting the sale and distribution of turtles with a shell length of <4 inches within the United States in 1975. The federal ban was effective, preventing an estimated 100,000 cases of TAS in children annually after its enactment¹⁴. Similar regulations prohibiting small turtles in Sweden also reduced their incidence of turtle-associated *Salmonella* infections¹⁵. In addition to

regulations, a public health education campaign providing appropriate information to the public about the risk of TAS also helped to decrease the number of cases of TAS.

Two cases of salmonellosis in children associated with red-eared sliders were first reported in Japan in 1975¹⁶. As subsequent reports of TAS arose, pet turtles were identified as a source of salmonellosis in Japan as well as other countries. Since then, several cases of TAS have been reported in Japan^{17–19}. The recommendations provided by the Ministry of Health, Labour and Welfare of Japan include: (i) wash hands thoroughly with soap and water after handling turtles, (ii) avoid keeping turtles at homes where children, elderly individuals, or individuals with weakened immune systems live; (iii) prevent turtles from roaming freely in homes, living areas, and food preparation areas; and (iv) avoid washing turtle enclosures and supplies in kitchen sinks²⁰.

The Japanese pond turtle is a species of turtle in the family *Geoemydidae* distributed in Japan that is a popular pet in Japan. Although Kameyama M *et al.* reported that *Salmonella* was isolated from two-thirds of Japanese pond turtles for sale in pet shops in Japan²¹, there have been no case reports of salmonellosis associated with Japanese pond turtles.

Unfortunately, in the present case, pulsed-field gel electrophoresis could not be performed. However, the patient was diagnosed with TAS because *Salmonella* Litchfield was isolated from his stool and the swab sample of the turtle's body; he had not ingested contaminated foods of animal origin. The infant never touched the turtles, so he could not have contracted *Salmonella* Litchfield directly from the turtles. It was assumed that he contracted *Salmonella* Litchfield via his father or the bathroom. His parents were unaware that the turtles may carry *Salmonella*. Fortunately, the patient responded well to treatment and recovered without complications, despite being at greater risk of developing complications and death due to his age.

In conclusion, Japanese pond turtles can be a sources of salmonellosis, as well as other reptiles. TAS can be prevented through careful hygiene and by limiting the interaction of infants and young children with turtles and their environments.

Conflict of interest: The authors declare no conflict of interest.

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