Turtle-Associated Human Salmonellosis

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A patient who bred exotic turtles as a hobby presented with 2 episodes of severe diarrhea, the second of which was proven to be caused by turtle-associated salmonellosis that was contracted during treatment with a proton-pump inhibitor. The literature about reptile-associated salmonellosis is briefly reviewed.

Nontyphoidal salmonellosis is a common cause of diarrhea and has the potential to cause death [1]. More than 2500 serotypes of Salmonella species have been described, 200 of which can be pathogenic in humans [2]. In addition to well-known sources such as poultry, eggs, and pork, reptiles are also a possible, although often unrecognized, source of Salmonella infection [3]. The risk of acquiring a Salmonella infection is elevated in immunocompromised hosts, but it is also elevated in patients with cases of impaired gastric acid production [4, 5]. We report the case of a patient with turtle-associated salmonellosis that was contracted during treatment with a proton-pump inhibitor.

Patient. A 53-year-old man was admitted to our hospital (VU University Medical Center, Amsterdam, The Netherlands) because of dehydration. His medical history revealed rheumatoid arthritis. His medication included diclofenac and, for 1 year prior to admission, omeprazole. Nine months before admission, the patient had had a 10-day episode of severe, dark-green colored diarrhea resulting in dehydration, for which he had been hospitalized. Cultures of stool specimens obtained after the initiation of treatment with ciprofloxacin showed no growth at that time. At the second admission, the patient had a 6-day history of fever (≤40°C), nausea, and frequent diarrhea, which had been watery and (again) dark-green, without blood or mucus. He had not recently traveled to tropical areas or eaten poultry, eggs, or uncooked meat. He bred exotic turtles as a hobby. On examination, he was moderately sick with signs of dehydration. The abdomen was slightly painful on palpation, but no other abnormalities were noted. Laboratory values were as follows: C-reactive protein, 41 mg/L; hemoglobin, 12.0 mmol/L; WBC count, 8.8 × 10^9 cells/L, with left shift; sodium, 129 mmol/L; potassium, 2.7 mmol/L; and creatinine level, 1.9 mg/dL (168 µmol/L). Cultures were performed on stool and blood samples. Treatment consisted of intravenous rehydration with isotonic saline and potassium. After 2 days, the diarrhea stopped, laboratory test results normalized, and the patient was discharged.

After discharge, Salmonella enteritidis was cultured from the feces samples. Blood cultures showed no growth. The same Salmonella species was cultured from a sample of pond water obtained from 1 of the patient’s 13 aquaria. It was also cultured from a cloacal swab sample—but not from a stool specimen—obtained from a 4-month-old freshwater turtle (Sternotherus odoratus) that was born in the same aquarium from which the sample of pond water was obtained. Both serotyping and amplified fragment-length polymorphism (AFLP) analysis revealed that the Salmonella strains obtained from the patient, the pond water, and the freshwater turtle were identical. The diagnosis of turtle-associated salmonellosis was thereby confirmed. It is possible that the omeprazole that the patient had recently begun receiving facilitated this infection. The patient was advised to use gloves when handling his turtles and to wash his hands or to use hand alcohol after direct contact with his turtles. In addition, diclofenac and omeprazole were replaced by celecoxib in the patient’s drug regimen.

Discussion. It is estimated that 1–3 million people in the US acquire a nontyphoidal salmonellosis annually, a disease which is mainly foodborne [6]. In the late 1970s, the carrier rate of Salmonella in home-held turtles in the US was 85% [7], and 14% of all nontyphoidal salmonellosis was attributed to transmission by turtles [8]. As a result of import restrictions and mandatory testing of turtles for the presence of Salmonella, the magnitude of the problem decreased [9]. At present, the carrier rate of Salmonella among pet turtles is 11%–12% in industrialized countries [10, 11]. Three percent of households in the US and Europe harbor a pet reptile, most often a turtle [12]. After the initial decline of reptile-associated salmonellosis in the late 1970s, its incidence has increased in the past decade to 7% of all Salmonella infections. This increase might be caused by the still-increasing popularity of turtles and other pet reptiles, such as lizards and snakes [13], all of which have been

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Table 1. Guidelines for preventing transmission of *Salmonella* from reptiles to humans.

| NOTE | Adapted from recommendations of the Centers of Disease Control and Prevention [12]. |

Clean hands with water and soap or hand alcohol after handling reptiles.

Persons at increased risk for infection or for serious complications of salmonellosis (e.g., children aged <5 years and immunocompromised persons) should avoid contact with reptiles.

Pet reptiles should not be kept in child care centers or households where children aged <5 years or immunocompromised hosts live or where a baby is expected.

Pet reptiles should not be allowed to roam freely throughout the home or living area.

Pet reptiles should be kept out of kitchens and other food preparation areas to prevent contamination.

associated with transmission of nontyphoidal *Salmonella* to humans [3].

Young turtles, in particular, carry *Salmonella* [14, 15], which is acquired in ovo or after hatching [16]. Turtles excrete *Salmonella* intermittently in their faeces, but *Salmonella* can also be isolated from the cloaca, the body surface, and pond water [10, 14]. Humans are primarily infected by the fecal-oral route, but transmission by claw scratches and bites is also possible [3]. However, some patients had only an indirect contact (e.g., a visiting turtle-keeper), and transmission through a platelet transfusion from a donor with a pet reptile (a snake) has also been described [17]. The risk of acquiring a *Salmonella* infection is elevated in young children (as a result of poor hygiene), in elderly persons, and in immunocompromised hosts [4]. In addition, impaired gastric acid secretion inhibits the natural defense against ingested *Salmonella* [5]. The relative risk of acquiring a *Salmonella* infection is 7 for turtle owners and 2 for users of antacids [18]. Specific measures for the prevention of reptile-associated human salmonellosis are listed in table 1.

Pet store owners occupy a unique position and have a responsibility to inform reptile owners or potential reptile owners of the possibility of acquiring a zoonosis, such as salmonellosis, and should know how to prevent contracting it.

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References


