

**TABLE 1. Severe acute respiratory syndrome–associated coronavirus (SARS-CoV) case classification before laboratory testing, by clinical and epidemiologic criteria**

Epidemiologic criteria	Clinical criteria for degree of illness		
	Early	Mild to moderate	Severe
Unknown	—	—	SARS RUI*-1
Possible	—	SARS RUI-2	SARS RUI-3
Likely	SARS RUI-4	SARS RUI-4	Probable case of SARS-CoV disease

\* Report under investigation.

**TABLE 2. Severe acute respiratory syndrome–associated coronavirus (SARS-CoV) case classification after laboratory testing, by initial report category**

Initial report category	Laboratory testing results		
	Negative*	Positive	Not performed
SARS RUI <sup>†</sup> -1 to SARS RUI-4	Excluded	Confirmed case of SARS-CoV disease	Undetermined <sup>§</sup>
Probable case of SARS-CoV disease	Excluded	Confirmed case of SARS-CoV disease	Probable case of SARS-CoV disease

\* Negative test as defined by negative antibody titer taken >28 days after the onset of symptoms. A negative polymerase chain reaction result does not rule out SARS-CoV disease.

<sup>†</sup> Report under investigation.

<sup>§</sup> Collection and/or laboratory testing of specimen was not completed.

## Reptile-Associated Salmonellosis — Selected States, 1998–2002

During 1998–2002, CDC received reports from state health departments regarding *Salmonella* infections in persons who had contact with reptiles (e.g., lizards, snakes, and turtles). *Salmonella* infections usually cause gastroenteritis but can result in invasive illness (e.g., septicemia and meningitis), especially in infants and immunocompromised persons. For decades, reptiles have been known as a source for salmonellosis (1); however, numerous reptile owners remain unaware that reptile contact places them and other household members, including children, at greater risk for salmonellosis (2). Increasing evidence suggests that amphibians (e.g., frogs, toads, newts, and salamanders) also can pose risks for salmonellosis in humans (3,4). This report describes cases of reptile-associated salmonellosis in six states\*, offers recommendations on preventing transmission of *Salmonella* from reptiles and amphibians to humans (Box), and provides an update on state regulations mandating education at pet stores about salmonellosis.

\* California, Connecticut, Florida, North Dakota, Ohio, and Wisconsin. At least six other states (Kansas, Maine, Maryland, Oklahoma, Washington, and Wyoming) reported similar cases.

### BOX. Recommendations for preventing transmission of *Salmonella* from reptiles and amphibians to humans

- Pet-store owners, health-care providers, and veterinarians should provide information to owners and potential purchasers of reptiles and amphibians about the risks for and prevention of salmonellosis from these pets.
- Persons at increased risk for infection or serious complications from salmonellosis (e.g., children aged <5 years and immunocompromised persons) should avoid contact with reptiles and amphibians and any items that have been in contact with reptiles and amphibians.
- Reptiles and amphibians should be kept out of households that include children aged <5 years or immunocompromised persons. A family expecting a child should remove any pet reptile or amphibian from the home before the infant arrives.
- Reptiles and amphibians should not be allowed in child-care centers.
- Persons always should wash their hands thoroughly with soap and water after handling reptiles and amphibians or their cages.
- Reptiles and amphibians should not be allowed to roam freely throughout a home or living area.
- Pet reptiles and amphibians should be kept out of kitchens and other food-preparation areas. Kitchen sinks should not be used to bathe reptiles and amphibians or to wash their dishes, cages, or aquariums. If bathtubs are used for these purposes, they should be cleaned thoroughly and disinfected with bleach.
- Reptiles and amphibians in public settings (e.g., zoos and exhibits) should be kept from direct or indirect contact with patrons except in designated animal-contact areas equipped with adequate hand-washing facilities. Food and drink should not be allowed in animal-contact areas.

### Case Reports

**California.** During December 2001, an infant aged 3 months was taken to an emergency department (ED) after 1 day of bloody diarrhea and fever. The infant was sent home with no therapy and recovered in 2 days; a stool specimen yielded *Salmonella* serotype Nima. Although no reptiles lived in the home, the infant's father was a high school biology teacher who handled reptiles in the classroom, including a large snake (i.e., a boa) that he often draped over his shoulders. A stool culture from the snake grew *S. Nima*. When interviewed, the father indicated that he knew reptiles carry *Salmonella* and was careful to wash his hands after handling them or their containers. However, he did not change clothing when he came home from work before holding his child.

**Connecticut.** During June 2002, a child aged 21 months was admitted to a hospital with fever, abdominal cramps, and bloody diarrhea. The child received no antibiotic therapy and was discharged the next day. Blood and stool cultures yielded *Salmonella* serotype Poonna. A sibling aged 6 years also had fever and bloody diarrhea and a stool culture that yielded *S. Poonna*. The family had purchased an iguana approximately 1 month earlier. The children had cleaned the iguana's cage and handled the iguana 2 days before their illness onsets. A stool culture from the iguana grew *S. Poonna*; isolates from the iguana and the two siblings were indistinguishable by pulsed-field gel electrophoresis (PFGE).

**Florida.** During January 2000, an infant aged 1 month visited a clinic with fever and diarrhea; the infant was not hospitalized. A stool specimen yielded *Salmonella* serotype Tennessee. One week before illness onset, the infant's family moved into a household that contained a bearded dragon (i.e., *Pogona vitticeps*). The pet reptile's cage had been washed in the kitchen near the infant's bottle nipples. A stool culture from the bearded dragon yielded *S. Tennessee*. Isolates from the infant and the bearded dragon were indistinguishable by PFGE. An adult in the house reported being aware that turtles and iguanas are reservoirs for *Salmonella* but unaware that all reptiles can carry *Salmonella*. The bearded dragon was placed outside the home and later donated to a zoo.

**North Dakota.** During March 1998, twin infants aged 2 weeks were admitted to a hospital after 1 day of poor feeding, diarrhea, and fever. They were treated intravenously with ampicillin for 6 days. The infants' mother and a child aged 3 years in the home also had diarrhea. Stool specimens from one of the twins, the mother, and the older child yielded *Salmonella* with the partial serotype O group 44, 45, 47, 48, or 50, H antigen G complex. The family recently had acquired an iguana, which was not allowed out of its cage. Only the mother handled the reptile and cleaned the cage. When the family learned that the iguana was the probable source of *Salmonella* infections, the iguana was euthanized. Culture of intestinal contents from the iguana yielded *Salmonella* with the same partial serotype as the patients' isolates. The clinical isolate from the twin was sent to CDC for complete serotyping and found to be *Salmonella* serotype IV 48:g,z<sub>51</sub>- (known formerly as *S. Marina*).

**Ohio.** During August–October 2000, local health departments reported seven gastrointestinal illnesses associated with iguanas or turtles acquired at county fairs. In one incident, two siblings aged 11 and 13 years with diarrhea and abdominal cramping visited an ED. No stool specimens were collected from the children. However, stool specimens from a turtle that the siblings received at a county fair yielded *Salmonella* serotype Sandiego. During the same period, a stool speci-

men from a man aged 20 years with diarrhea also yielded *S. Sandiego*; he recently had won a turtle at a county fair. Isolates from the children's turtle and the man were indistinguishable by PFGE.

**Wisconsin.** During November 2002, an infant aged 24 days was admitted to a hospital after 1 day of bloody diarrhea. The infant was hospitalized for 3 days and received intravenous fluids and supportive care. A stool culture yielded *Salmonella* serotype IV 44:z<sub>4</sub>z<sub>23</sub>-. The infant was treated for 14 days with oral amoxicillin. An iguana was reported living in the home of the infant's father; however, attempts to collect stool samples from the iguana were unsuccessful.

Two weeks later, an infant aged 4 months in a neighboring county visited a hospital after 8 days of fever of 100.3° F (37.9° C) and 3 days of decreased range of motion in the left hip. *Salmonella* serotype IV 44:z<sub>4</sub>z<sub>23</sub>- was isolated from both left hip aspirate and blood cultures. The infant was hospitalized for 6 days and treated intravenously with cefotaxime and gentamicin. An iguana was reported living in the infant's home, but the reptile was removed before it could be tested. Both iguanas associated with the infants were traced back by the state health department to the same distributor in Florida.

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**Editorial Note:** Salmonellosis associated with reptiles is a continuing public health concern (5,6). During the 1970s, small pet turtles were a major source of *Salmonella* infections in the United States (1). In 1975, the Food and Drug Administration banned commercial distribution of small (i.e., <4 in. long) turtles; the majority of states prohibited the sale of such turtles. These measures prevented an estimated 100,000 cases of salmonellosis among children each year (1). However, reptiles remain popular pets in the United States; during 1991–2001, the estimated number of households with reptiles doubled from approximately 850,000 to 1.7 million (7). The increase in pet reptile popularity has been paralleled by an increase in the number of reptile-related *Salmonella* serotypes isolated from humans (2,6).

Reptiles are commonly colonized with *Salmonella* and shed the organism intermittently in their feces (6). Attempts to treat reptiles with antibiotics to eliminate *Salmonella* carriage

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not to stop questioning."*

Albert Einstein

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have been unsuccessful and might lead to increased antibiotic resistance (5). *Salmonella* survives well in the environment and can be isolated for prolonged periods from surfaces contaminated by reptile feces (8). For this reason, even minimal indirect contact with reptiles can result in illness (2,5).

Increasing evidence suggests that amphibians also are a source for salmonellosis (3,4). Frogs and toads are frequent carriers of *Salmonella* and have been linked by epidemiologic evidence to outbreaks (3,4). In a population-based, case-control study, housing an amphibian was associated independently with *Salmonella* infection (3). Overall, reptile and amphibian contacts are estimated to account for 74,000 (6%) of the approximately 1.2 million sporadic *Salmonella* infections that occur each year in the United States (3).

Gaps remain in the public's understanding of amphibian- and reptile-associated salmonellosis. In one study, fewer than half the families with salmonellosis and known iguana exposure suspected their iguanas might have been the cause of illness (2). Pet-store owners, health-care providers, and veterinarians should provide information and prevention messages about salmonellosis to owners and potential purchasers of reptiles and amphibians. Educational materials are available from the Pet Industry Joint Advisory Council, telephone 800-553-7387.

In 1999, the National Association of State Public Health Veterinarians and the Council of State and Territorial Epidemiologists recommended that state and local agencies adopt regulations to prohibit the sale or gift of reptiles without written point-of-sale education to consumers about the risks for and prevention of reptile-associated salmonellosis (9). In February 2003, CDC polled health departments in all 50 states and New York City (NYC) to determine whether such regulations existed. Among the 49 health departments responding, four states (Colorado, Illinois, Kansas, and Texas) required pet stores to provide information about salmonellosis to persons purchasing any reptile; five (California, Connecticut, Maryland, Michigan, and New York) required providing salmonellosis information to persons purchasing a turtle but not other reptiles. Tennessee prohibited sale of all turtles. NYC prohibited sale of certain reptiles, including iguanas, small turtles, and boas, and required posting of information about reptile-associated salmonellosis where other reptiles were sold.

Evaluation of the effectiveness of mandated point-of-sale education in reducing amphibian- and reptile-associated salmonellosis could help guide future prevention efforts. In the meantime, areas such as NYC have adopted restrictions on the sale of certain reptiles similar to those for small turtles.

## References

1. Cohen ML, Potter M, Pollard R, Feldman RA. Turtle-associated salmonellosis in the United States: effect of public health action, 1970 to 1976. *JAMA* 1980;243:1247-9.
2. Mermin J, Hoar B, Angulo FJ. Iguanas and *Salmonella* Marina infection in children: a reflection of the increasing incidence of reptile-associated salmonellosis in the United States. *Pediatrics* 1997;99:399-402.
3. Mermin J, Hutwagner L, Vugia D, et al. Reptiles, amphibians, and human *Salmonella* infection: a population-based, case-control study. *Clin Infect Dis Suppl* (in press).
4. Srikantiah P, Lay JC, Crump JA, et al. An outbreak of *Salmonella* Javiana associated with amphibian contact—Mississippi, 2001. Presented at the International Conference on Emerging Infectious Diseases, Atlanta, Georgia, 2002.
5. CDC. Reptile-associated salmonellosis—selected states, 1994–1995. *MMWR* 1995;44:347-50.
6. CDC. Reptile-associated salmonellosis—selected states, 1996–1998. *MMWR* 1999;48:1009-13.
7. Wise JK, Heathcott BL, Gonzalez ML. Results of the AVMA survey on companion animal ownership in U.S. pet-owning households. *J Am Vet Med Assoc* 2002;221:1572-3.
8. Friedman CR, Torigian C, Shillam PJ, et al. An outbreak of salmonellosis among children attending a reptile exhibit at a zoo. *J Pediatr* 1998;132:802-7.
9. Council of State and Territorial Epidemiologists. Reptile-associated salmonellosis and prevention education. CSTE position statement 1999-ID 13. Available at <http://www.cste.org/ps/1999/1999-id-13.htm>.

## Public Health Dispatch

### Tuberculosis Outbreak Among Homeless Persons — King County, Washington, 2002–2003

The Public Health–Seattle and King County (PH-SKC) Tuberculosis Control Program, with assistance from the Washington State Department of Health and CDC, is continuing to investigate an ongoing outbreak of tuberculosis (TB) disease among homeless persons in Seattle (1). This report describes patient characteristics, methods used to identify active TB cases and contacts at highest risk for exposure, and control measures under way to prevent further transmission of this outbreak strain of *Mycobacterium tuberculosis*.

During 1999–2001, PH-SKC reported an annual average of 13 cases of TB among the homeless population. In 2002, diagnosis of TB in 30 homeless patients prompted an investigation. As of September 30, 2003, PH-SKC had identified 44 outbreak-associated TB patients with dates of diagnosis during May 2002–September 2003. Outbreak-associated TB patients have been defined according to the following criteria: 1) having an *M. tuberculosis* isolate with a matching 15-band restriction fragment length polymorphism (RFLP) pattern (2) ( $n = 39$ ) or 2) if RFLP analysis is pending, having an epidemiologic link to a patient whose isolate matched the outbreak pattern ( $n = 5$ ). All but three of the outbreak-associated patients were homeless at the time of diagnosis; 43 (98%)

were born in the United States, 34 (77%) were male, 21 (48%) were American Indian/Alaska Native, and 17 (39%) were black. Of the 38 (86%) patients with pulmonary disease, 23 (61%) had acid-fast bacilli identified on sputum smear at diagnosis. Seven (16%) outbreak-associated patients also were infected with human immunodeficiency virus (HIV).

In January 2003, an investigation conducted by PH-SKC assisted in identifying contacts at highest risk for exposure. Investigators reinterviewed outbreak patients and health-care providers serving homeless facilities to identify additional patient contacts. Sites of transmission were determined by review of homeless facility intake registries for the presence of infectious patients and the rates of positive tuberculin skin testing (TST) results among staff and clients. Exposed cohorts were identified at three sites of transmission. The cohort prioritized for intensive screening included 385 contacts from three homeless facilities and 86 other contacts named by patients or health-care providers.

In February 2003, PH-SKC began an intensive effort to screen the high-priority cohort for TB disease and latent TB infection (LTBI) in the TB clinic and at homeless facilities, which included symptom review, chest radiograph, sputum examination and culture, TST, and voluntary HIV counseling and testing. During February 1–September 30, PH-SKC screened approximately 380 contacts with a chest radiograph and/or sputum culture. Of the 44 outbreak-associated patients, 20 were reported during this time, and 11 (55%) were identified through PH-SKC screening efforts, limiting the amount of time these patients were exposing others in the community. As of December 9, all homeless outbreak-associated patients with TB disease and some contacts with LTBI were receiving directly observed therapy.

Focused, intensified screening efforts for early detection and treatment of both TB disease and LTBI are under way to control transmission in the King County community (3). TB controllers, particularly those from western states, should consider the possibility of unrecognized TB outbreaks involving homeless persons in their communities.

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## References

1. Public Health Seattle and King County. Recent increase in tuberculosis among homeless persons in King County. *Epi-Log Communicable Disease and Epidemiology News* 2002;42:11. Available at [http://www.metrokc.gov/health/phnr/prot\\_res/epilog/vol4211.htm#tb](http://www.metrokc.gov/health/phnr/prot_res/epilog/vol4211.htm#tb).