

# ***Salmonella* from Baby Turtles**

[Announcer] *This program is presented by the Centers for Disease Control and Prevention.*

[Sarah Gregory] I'm talking today with Dr. Stacey Bosch about her article on *Salmonella* and baby turtles. Dr. Bosch is a veterinarian with CDC. Welcome Dr. Bosch.

[Stacey Bosch] Thank you, it's great to be here.

[Sarah Gregory] Dr. Bosch, there's been a ban on baby turtles less than four inches long since 1975 because of the risk of *Salmonella*. What effect did this ban have on outbreaks?

[Stacey Bosch] Small baby turtles first became popular pets in this country during the 1960s. By the early 1970s, around four percent of all U.S. households owned at least one pet turtle and it was estimated that around 14 percent of all human *Salmonella* infections were attributed to these small pet turtles. Most of these illnesses were in children. In 1975, the U.S. Food and Drug Administration enacted a ban making it illegal to sell and distribute small turtles with a shell length of less than four inches with one exception—for turtles being sold for bona fide scientific and educational purposes. The ban was considered to be a very effective public health measure and was estimated to prevent around 100,000 cases of turtle-associated *Salmonella* infections in children each year after its enactment. By the late 1990's, only six percent of *Salmonella* infections in the United States were associated with reptile or amphibian contact.

[Sarah Gregory] According to your article there's been a recent surge in *Salmonella* outbreaks and you suggest the best way to combat this is by taking a One Health approach. What is One Health?

[Stacey Bosch] The term "One Health" refers to a concept which recognizes that the health of humans is connected to the health of animals and the environment. When applied to the context of preventing future outbreaks of *Salmonella* from turtles, the combined efforts of human, animal, and environmental health professionals are crucial. A One Health approach is important to outbreak investigations and can help officials track down the ultimate source of contaminated turtles through distribution networks back to a turtle farm.

A One Health approach also applies towards education. For example, pediatricians and family practice physicians can educate families about the risk of turtle-associated salmonellosis infections during wellness exams for young children. Pediatricians and veterinarians can recommend appropriate pets for each family; turtles and other reptiles are not recommended as pets for households with children five years of age or younger. Veterinarians can also educate clients on proper turtle care and handling practices, such as hand washing, to minimize the risk of *Salmonella* exposure. Public health partners can help spread awareness of the risk of pet turtles as a source of *Salmonella* infections in people.

[Sarah Gregory] Are there new trends in turtle buying?

[Stacey Bosch] Yes. Pet turtles are becoming more popular in the United States. Estimates of U.S. pet ownership by the American Veterinary Medical Association show that in the 1990s,

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the number of U.S. households that owned a pet turtle was small compared to the numbers we saw in the 1970s. Then, over the next 15 years, the trend increasingly grew. By 2012 over one million households had a pet turtle. Turtles are the most common reptile species owned as pets. Approximately twice as many households own turtles than own pet snakes or lizards.

[Sarah Gregory] Why are these tiny turtles particularly risky for children?

[Stacey Bosch] Small turtles seem like attractive and safe pets for young children. They aren't very expensive to purchase or to keep and they are slow moving and gentle. However, it's important to realize that *Salmonella* infections from turtles occur most frequently in children. We think that happens for a number of reasons. First, the turtle hatchlings are small enough to fit into a child's mouth; their shells are about the size of a U.S. quarter. Very young children often put things in their mouths, including small baby turtles, creating an opportunity for *Salmonella* and other germs to be transmitted. Second, young children do not have fully developed immune systems and it can be harder for their bodies to fight off infection.

Another reason turtles are risky for children is cross-contamination from the turtle's habitat. Tiny turtles are often kept in a small pool of water in a plastic turtle bowl, which can become heavily contaminated with *Salmonella*. When these habitats are cleaned in a kitchen sink or a bathtub, it can contaminate that sink or bathtub and any items that surround it, such as dishes or baby bottles, with *Salmonella*. An infant may pick up *Salmonella* from a baby bottle that was in the sink and become infected, even if he or she never directly touched the tiny turtle.

Finally, handwashing is an important step in preventing disease, but even the most diligent caregivers can have difficulty ensuring that young children wash their hands immediately and properly after handling a pet turtle or its habitat.

[Sarah Gregory] Are there any legal safe turtle farmers in the U.S. and is it actually possible to produce a salmonella-free turtle?

[Stacey Bosch] Turtle farming itself is perfectly legal; however, turtle farmers also have to comply with the federal ban and cannot sell or distribute turtles with a shell length of less than four inches in the United States. Many farmers either export small turtles outside of the U.S. for international sale or they sell larger, mature turtles to retailers within the U.S.

It's important to remember that *Salmonella* bacteria are a normal part of a turtle's gut flora. All reptiles, including turtles, can carry *Salmonella* and can spread the germ to people. In the 1980s, academic researchers developed methods designed to reduce *Salmonella* on turtle eggs with the goal of hatching a baby turtle that doesn't carry *Salmonella*. Although these methods might reduce *Salmonella* under research conditions, they do not lead to a *Salmonella*-free turtle. We don't know if reducing *Salmonella* on turtle eggs will reduce *Salmonella* in the farm environment. So even if the turtle egg treatments were to eliminate *Salmonella* from a turtle, the turtle could easily become recolonized with the bacteria.

The way turtles are transported also makes it difficult to reduce *Salmonella*. Turtles are often shipped in a box with many other turtles, where they are comingled with turtles from other sources in a store tank. In the tank, they can spread *Salmonella* from turtle to turtle before being sold to customers.

Turtles can shed *Salmonella* in their droppings at different times, so laboratory testing of turtles does not reliably guarantee that turtles aren't free of *Salmonella*. In addition, laboratory testing methods vary and some methods may not adequately detect the presence of *Salmonella*. We've seen multiple outbreaks of human *Salmonella* infections that were attributed to turtles which reportedly were *Salmonella*-free.

[Sarah Gregory] How are people getting these baby turtles, if they're banned?

[Stacey Bosch] In spite of the ban, small turtles can be illegally purchased from a wide variety of sources, including retail pet stores, discount stores, flea markets, roadside vendors, beach souvenir shops, and online merchants. Also, they are often purchased at fairs, outside of sporting events, or at parks. Many of these are transient vendors, meaning that they are mobile and do not have a brick and mortar store. So when public health authorities find out about them, they have already moved on, making any enforcement activity very difficult.

We are also aware of merchants exploiting the loophole in the ban that allows for the sale of small turtles for "bona fide scientific and educational purposes." Commonly, a merchant will have a client sign a disclaimer stating they are purchasing a turtle for that reason, when in fact they are really purchasing a turtle for a pet. It's a problem that has been very hard for federal and state public health and regulatory officials to stop.

[Sarah Gregory] Are there ways to educate the public or vendors and put a stop to this continuing public health problem?

[Stacey Bosch] This goes back to the integrated One Health approach that is needed to tackle this problem. Prevention messages can be shared with the public by both human and animal healthcare providers. Public health officials can also provide prevention messages to the public through websites, publications, and social media campaigns.

We also think that the retail pet industry can play a role in prevention. In their stores, they can prominently display information on the risks of acquiring a *Salmonella* infection from turtles and other reptiles and amphibians. Pet store staff can reinforce these messages with customers and direct them to a different pet, if needed. CDC and state health departments are engaging reptile hobbyists and tradeshow groups, as well as representatives from the pet industry, to develop an integrated approach for keeping illegal turtles out of the marketplace.

When it comes to identifying and stopping merchants who are illegally selling small turtles, it gets a bit more complicated since it depends on the laws in each state. Some states have laws or regulations that prohibit or restrict the sale of small turtles, enabling the state to pursue enforcement activities within their jurisdictions. For those states that don't, they've had to use other means, such as directly asking the merchants to voluntarily stop selling small turtles during an outbreak. In other cases, state public health investigators have partnered

with the Department of Agriculture or Department of Fish and Wildlife. These departments have enforcement authorities over the sale of animals and over the introduction of invasive species.

When it comes to preventing turtle-associated *Salmonella* infections, it really does take a village—one of new partnerships and new ways of approaching this very old problem.

[Sarah Gregory] Thank you, Dr. Bosch. I've been talking with Dr. Bosch about her July 2016 article, "Turtle-Associated Salmonellosis, United States, 2006-2014." You can read the entire article online at [cdc.gov/eid](http://cdc.gov/eid).

I'm Sarah Gregory for Emerging Infectious Diseases.

*[Announcer] For the most accurate health information, visit [www.cdc.gov](http://www.cdc.gov) or call 1-800-CDC-INFO.*