Reptiles and Salmonella: An Overview of What You Need to Know!

Salmonella is a genus of primarily rod shaped bacteria found worldwide, with two species being known, *Salmonella enterica* and *Salmonella bongori*, which is by far the more commonly seen species in the digestive tracts, as well as on or in the skin, scales, food, and water of captive reptiles and amphibians, as well as other animals. However, Salmonella enterica has also been frequently found in captive reptiles, as well as Salmonella typhimurium also having been associated or found with reptiles. According to the CDC (or Centers for Disease Control & Prevention), most people infected with Salmonella develop diarrhea, fever, dehydration, and/or abdominal cramping anywhere from 12 to 72 hours and lasting anywhere from 4 to 7 days, with most individuals recovering. However, sometimes more serious signs and symptoms can manifest requiring hospitalization, particularly among elderly adults, infants and young children 5 or under, and those with otherwise compromised immune systems.

Reptiles generally shed or excrete salmonellae intermittently through their feces, and because this excretion oftentimes is not continuous, it can often be difficult to identify or diagnose infected reptiles when only one initial bacteriological exam may have been performed. Captive reptiles can contract salmonella through several different means, whether through ingestion of contaminated food or diets (whether vegetable matter or living prey animals), or oftentimes through their natural range and countries of origin prior to exportation. Reptiles already infected with salmonellosis, whether due to unsanitary and unhygienic enclosures or living conditions, or these other above causes, are most often direct, or indirect sources of infections of other captive reptiles, and/or other household animals. In all cases, conditions leading to overcrowding and/or overstressing of affected animals oftentimes play very high roles in the level of risk and exposure to humans and other animals.

Reptiles infected with salmonella oftentimes are asymptomatic, or do not develop any visible signs of clinical disease; however, in some cases, septicemia, pneumonia, abscesses, coelomitis, osteomyelitis, and other conditions have been observed. Salmonellae excreted by both wild and captive reptiles can often be difficult to treat, as these bacterium can often become highly resistant to many anti-biotics and antibiotic treatment options. Furthermore, antibiotic-resistant salmonellae may act as a source of genes responsible for the antibiotic resistance that are transferred to other bacteria present in the gastrointestinal tract (Valentina; Asian Pacific Journal of Tropical Medicine, Aug. 2017). These are reasons why human and public health measures, and best management practices and protocols are important are recommended for best being able to mitigate salmonellosis infections in captive reptiles.

Reports and accounts mentioning the zoonotic disease (diseases & parasites which can be transferred to humans from animals) potential when keeping pets have become increasingly commonplace in the news and media. Reptiles and other "exotics" are frequently depicted by anti-pet organizations and the media as posing a serious public health and safety risk due to the transmission of Reptile associated salmonellosis (RAS) and other such zoonotic diseases. However, the truth is that they only make up a very minuscule percentage of overall numbers of cases, and that many other animals and sources can also be sources for infection. Provided below is a breakdown of salmonella case data from the CDC (Centers for Disease Control & Prevention) examining human and non human sources of infection. Unfortunately, 2009 is the most recently available published data from the CDC on RAS that we could locate and are aware of. Most of the more recent published RAS data and statistics are concerning specific outbreaks of zoonotic diseases involving reptiles or other pets. We will continue to keep a look out for additional published statistics from the CDC and other sources as much as possible.

Keep in mind that pet reptiles are not always the cause for all salmonella infections and/or outbreaks, and laboratory testing is required to identify the causative strain of salmonella bacteria. Practicing basic, common sense hygiene measures as well as husbandry, cleaning, and handling will greatly reduce the likelihood of contracting illnesses. Despite these risks, the benefits of having any pet outweigh the potential risks greatly. Keeping reptiles, and pets in general, contributes to many different factors including but not limited to child development, providing mental therapy, stimulation, and companionship, and improve overall health.

There are an estimated **1.4 million** cases of salmonella with **19,000** hospitalizations and **380** deaths every year (CDC 2007-2008) according to the Centers for Disease Control & Prevention website (CDC).

Crested Geckos (*Salmonella* Muenchen)-2015
-22 cases
-3 hospitalizations
-0 deaths
0.0015% of total cases, 0.015% of hospitalizations, 0% of deaths.

Bearded Dragons (*Salmonella* Cotham and *Salmonella* Kisarawe)-2012-2014
-166 cases
-61 hospitalizations (37%)
-0 deaths
0.012% of total cases, 0.321% of hospitalizations, 0% of deaths.

Frozen Feeder Rodents (*Salmonella* Typhimurium)-2014
-41 cases
-6.5 hospitalizations (16%)
-0 deaths.
0.0029% of cases, 0.034% of hospitalizations, 0% of deaths.

Turtles (*Salmonella* Sandiego, *Salmonella* Pomona, and *Salmonella* Poona)-2012-2013
-473 cases.
-78 hospitalizations.
-0 deaths.
0.337% of cases, 0.411% of hospitalizations, 0% of deaths.

Hedgehogs (another common exotic animal species) (*Salmonella* Typhimurium)-2012
-26 cases.
-8 hospitalizations
-1 death
0.0018% of cases, 0.042% of hospitalizations, 0.26% of deaths.

April 2015 issue of Archives of Disease in Childhood -2010-2013
-175 children under 5 years contracted salmonella during this time frame.
-Approximately 48 reptile associated cases (27.4%).
-23 hospitalizations thereof (48%).
- 17% of children hospitalized with "reptile related salmonella" developed a more serious infection requiring surgery (8 cases)
- 2.7% of households owned a reptile in 2013 (3,306,393 households).

0.0014% of reptiles associated with cases, 0.0007% of reptiles associated with hospitalizations, 0.00024% of reptiles associated with more serious complications.

CDC Salmonella Statistics from 2009

48,699 cases of laboratory-confirmed salmonellosis in 2009

40,828 (84%) from human sources

7,871 (16%) cases from non-human sources

Salmonella infections from non-human sources:

§ Chicken: 4,464

§ Turkey: 914

§ Porcine: 339

§ Bovine: 336

§ Other Birds / Wild Animals: 136

§ Equine: 74

§ Reptile: 19

§ Other Domestic Animals: 6

§ All Other Sources: 1,583

Overall, keeping reptiles and amphibians poses only a miniscule risk of contracting salmonella. Below, you will also find some of MAHS' basic recommendations every owner can take to keep their pets, and themselves healthy.

- Any owner of reptiles or amphibians should wash, disinfect, or sanitize their hands after touching or handling an animal, its feeders, and/or its substrate or other furnishings.

- Children under 5 and those with lessened or compromised immune systems should either avoid contact or use extra precautions when dealing with reptiles & amphibians.

- Not to allow any reptile or amphibian free roam or access to free roam around the home or other living area.

- Keeping reptiles & amphibians and/or enclosures or supplies to be cleaned and maintained out of food preparatory areas (kitchens) and personal hygiene areas (such as bathroom sinks, etc).

- Avoid kissing or otherwise engaging in close facial contact with any reptile or amphibian.

Perhaps most importantly, maintain cleanliness of animal enclosures and/or other areas where animals are specifically designated to be kept.

For more information, you can also visit the Wisconsin Department of Health Services (DHS) information website on reptiles and salmonella: Reptile-Associated Salmonellosis | Wisconsin Department of Health Services

Also see the United States Association of Reptile Keepers (USARK)'s information on reptiles and salmonella: Education: Salmonella | USARK - United States Association of Reptile Keepers