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Amphibians and reptiles as a source of Salmonella – a review of Salmonella outbreaks in a period of last ten years

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Introduction

Increasing trends of keeping reptiles and amphibians as pets have been observed. These vertebrates can be asymptomatic carriers of *Salmonell*a species and can cause infection by transmission of pathogen to humans, especially in infants, young children and people with immunodeficiencies.

Goal

The goal of this review is to **document the most dangerous outbreaks of salmonellosis caused by contact with amphibians and reptiles that appeared in last ten years.** This review is based on the analysis of the available literature.

Salmonellosis

Salmonella strains isolated from amphibians and reptiles differ genetically from strains isolated from humans.


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The differences rely mainly on the activation of virulence factors that cause pathogenicity in humans.

Examples of vertebrates

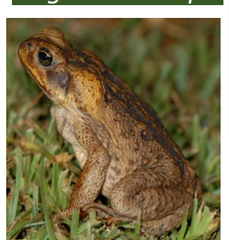

Pogona vitticeps


Alligator Mississippiensis


Timon lepidus


Caiman yacare


Anolis carolinensis


Bufo marinus


Hemidacyulus frenatus

Table 1: The most often isolated from amphibians and reptiles *Salmonella* strains causing outbreaks

Year of outbreak	Isolated pathogen	Species of vertebrates	Reference	Country
2009	*S.* enterica subsp. arizonae	*Pantherophis guttatus*	1	France
2011	*S.* Paratyphi B var. L (+)	Small turtles	5	USA
2012	*S.* Amsterdam, *S.* Poona, *S.*Bareilly	*Naja kaouthia, Hoplobatrachus rugulosus*	6	Thailand
2017	*S.* Oranienburg	***Pogona vitticeps***	7	Czech Republic
2015	*S.* Weltevreden	*Hemidactylus frenatus*	11	Costa Rica
2012	*S.* Tennessee 6,7:z29:	***Pogona vitticeps***	2	Germany
2017	*S.* Pomona	***Alligator Mississippiensis***	8	USA
2016	*S.*enterica subsp. houtenae serovar IV 43:z_4,z_{32}:	*Agkistrodon bilineatus taylori*	9	USA
2016	*S.* Thompson	Pet turtles	10	China
2014	*S.* Saintpaul, *S.* Mississippi	*Sphenodon punctatus, Pachyptila turtur, Oligosoma spp.*	12	New Zealand
2012	*S.* Newport 6,8:e.h:1,2:z67	*Pantherophis guttatus*	2	Germany
2014	*S.* Oranienburg	***Anolis carolinensis***	13	Japan
2014	*S.* Pomona	*Trachemys scripta elegans*	14	China
2011	*S.* Kibusi, *S.* enterica subsp. salamae serovars 41:z10:z6 and 18:z10:z6	***Timon lepidus***	15	Spain
2011	*S.* infantis, *S.* nottingham	***Caiman yacare***, *Caiman latirostris*	16	Argentina
2013	*S.* Thompson, *S.* Typhimurium	*Emys orbicularis Trachemys scripta elegans*	3	Spain
2013	*S.* Javiana, *S.* Rubislaw	***Bufo marinus***	17	Grenada
2010	*S.* Rubislaw	***Pogona vitticeps***	4	Australia

Table 2:Recommendation of WHO

The World Health Organization (WHO) has made the following recommedations to minimize the risk of salmonellosis, due to RAS salmonellosis (reptile – associated salmonellosis)[18].

- Clean the amphibians /reptiles' living area outside the home
- Limit the contact of infants, young children and persons with reduced resistance with reptiles / amphibians
- Avoid keeping reptiles / amphibians in places where meals are prepared or consumed.
- Change clothes after each contact with reptiles / amphibians
- Avoid contact with amphibians and reptiles while eating, drinking or smoking,
- Don’t kiss or snuggle with reptiles and amphibians.
- Wash your hands after each contact with reptiles / amphibians
- All reptiles and amphibians keeping in houses should be considered as a potential source of pathogens.

References

1. Schneider L., et al (2009) Salmonella enterica subsp. arizonae bone and joints sepsis.
2. Lammers B. et al (2012) Prevalence of Salmonella sp. Isolated from Cryptobranchus alleganiensis alleganiensis in Eastern Tennessee”
3. Briones V. et al. (2004) “Salmonella diversity associated with wild reptiles and amphibians in Spain,”
4. Moffatt C., Lafferty A.R.et al. (2010) Salmonella Rubislaw gastroenteritis linked to a pet lizard.
5. Centers for Disease Control and Prevention (CDC) (2012): outbreak of salmonellosis associated with pet turtle exposures – United States, 2011.
6. Prapasarakul N. (2012) ,, Salmonella serovar distribution in cobras (Naja kaouthia), snake-food species, and farm workers at Queen Saovabha Snake Park,
7. Tomastikova Z., (2017) Salmonellosis in an infant as a result of indirect contact with reptiles
8. Sakaguchi K., (2017) *Salmonella* Enterica Serovar Pomona Infection in Farmed Juvenile American Alligators (*Alligator Mississippiensis*).
9. Clancy M., et al. (2016) Management of osteomyelitis caused by Salmonella enterica subsp. Houtenae in a Taylor’s cantil (*Agkistrodon Bilineatus Taylori)* using amikacin delivered via osmotic PUMP,
10. Zhang J. et al. (2016) Turtles as a Possible Reservoir of Nontyphoidal *Salmonella* in Shanghai, China.
11. Jiminez RR. et al.(2015) *Salmonella* Isolates in the Introduced Asian House Gecko (*Hemidactylus frenatus*) with Emphasis on *Salmonella* Weltevreden in Two Regions in Costa Rica.
12. Middelton DM. et al. (2014) Reptile reservoirs and seasonal variation in the environmental presence of Salmonella in an island ecosystem, Stephens Island, New Zealand.
13. Sumiyama D. et al (2014) Salmonella infection in green anoles (*Anolis carolinensis*), an invasive alien species on Chichi Island of the Ogasawara archipelago in Japan. *J*
14. Gong St. et al (2014) Highly pathogenic Salmonella Pomona was first isolated from the exotic red-eared slider (*Trachemys scripta elegans*) in the wild in China: Implications for public health.
15. Martinez R. et al. (2011) *Salmonella* spp. and Shiga toxin-producing *Escherichia coli* prevalence in an ocellated lizard (*Timon lepidus*) research center in Spain.
16. Uhart M. et al. (2011) Isolation of *Salmonella* spp. from yacare caiman (*Caiman yacare*) and broad-snouted caiman (*Caiman latirostris*) from the Argentine Chaco.
17. Drake M. et al. (2013) Prevalence of Salmonella spp. in cane toads (Bufo marinus) from Grenada, West Indies, and their antimicrobial susceptibility.
18. Steven J. Et. Al. (2004) Guidelines for use of live amphibians and reptiles in field and laboraotry research, 2nd edition, (http://www.asih.org/sites/default/files/documents/resources/guidelinesherpsresearch2004.pdf)