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

Mateusz Drozd

Department of Microbiology, Institute of Genetics and Microbiology, University of Wrocław

Gabriela Bugla-Plooskonska

Department of Microbiology, Institute of Genetics and Microbiology, University of Wrocław, Poland

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

Mateusz Drozd and Gabriela Bugla – Ploskonska,

Department of Microbiology, Institut of Genetics and Microbiology, University of Wroclaw, Poland,

e-mail: mateusdrozd5@tlen.pl, gabriela.bugla-ploskonska@uwr.edu.pl



Introduction

Increasing trends of keeping reptiles and amphibians as pets have been observed. These vertebrates can be asymptomatic carriers of *Salmonella* 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.



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

Examples of vertebrates



Pogona vitticeps



Alligator mississippiensis



Timon lepidus



Anolis carolinensis



Caiman yacare



Bufo marinus



Hemidactylus 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	<i>S. enterica</i> subsp. <i>arizonae</i>	<i>Pantherophis guttatus</i>	1	France
2011	<i>S. Paratyphi B</i> var. L (+)	Small turtles	5	USA
2012	<i>S. Amsterdam</i> , <i>S. Poona</i> , <i>S. Bareilly</i>	<i>Naja kaouthia</i> , <i>Hoplobatrachus rugulosus</i>	6	Thailand
2017	<i>S. Oranienburg</i>	<i>Pogona vitticeps</i>	7	Czech Republic
2015	<i>S. Weltevreden</i>	<i>Hemidactylus frenatus</i>	11	Costa Rica
2012	<i>S. Tennessee</i> 6,7:z29:	<i>Pogona vitticeps</i>	2	Germany
2017	<i>S. Pomona</i>	<i>Alligator Mississippiensis</i>	8	USA
2016	<i>S. enterica</i> subsp. <i>houtenae</i> serovar IV 43:z4,z32:	<i>Agkistrodon bilineatus taylori</i>	9	USA
2016	<i>S. Thompson</i>	Pet turtles	10	China
2014	<i>S. Saintpaul</i> , <i>S. Mississippi</i>	<i>Sphenodon punctatus</i> , <i>Pachytila turtur</i> , <i>Oligosoma spp.</i>	12	New Zealand
2012	<i>S. Newport</i> 6,8:e.h:1,2:z67	<i>Pantherophis guttatus</i>	2	Germany
2014	<i>S. Oranienburg</i>	<i>Anolis carolinensis</i>	13	Japan
2014	<i>S. Pomona</i>	<i>Trachemys scripta elegans</i>	14	China
2011	<i>S. Kibusi</i> , <i>S. enterica</i> subsp. <i>salamae</i> serovars 41:z10:z6 and 18:z10:z6	<i>Timon lepidus</i>	15	Spain
2011	<i>S. infantis</i> , <i>S. nottingham</i>	<i>Caiman yacare</i> , <i>Caiman latirostris</i>	16	Argentina
2013	<i>S. Thompson</i> , <i>S. Typhimurium</i>	<i>Emys orbicularis</i> <i>Trachemys scripta elegans</i>	3	Spain
2013	<i>S. Javiana</i> , <i>S. Rubislaw</i>	<i>Bufo marinus</i>	17	Grenada
2010	<i>S. Rubislaw</i>	<i>Pogona vitticeps</i>	4	Australia

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Table 2: Recommendation of WHO

The World Health Organization (WHO) has made the following recommendations 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.