



REPTILE-ASSOCIATED SALMONELLOSIS

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■ INTRODUCTION

During 1994-95 health departments in 13 U.S. states have reported cases of persons infected with unusual serotypes of *Salmonella* in which patients had direct or indirect contact with reptiles such as lizards, snakes or turtles.

In many of these cases the same serotype of *Salmonella* was isolated from patients and from reptiles with which they had direct or indirect contact. Indirect contact is contact with a person who had contact with reptiles. In some cases infection resulted in invasive illness such as sepsis and meningitis. This web page summarizes six case examples and presents guidelines people who work with reptiles can take in order to prevent infecting themselves or others with *Salmonella*.

■ CONNECTICUT

During January, 1995 a 40 year old man was hospitalized for acute illness characterized by constipation, lower back pain, chills and fever. He reported having taken ranitidine and an antacid for symptoms of heartburn before onset of mild diarrhea 3-days prior to hospitalization. Blood culture yielded *Salmonella* serotype Wassenaar. An MRI scan of the right sacrum suggested osteomyelitis. Ciprofloxacin therapy was initiated for presumed *Salmonella* osteomyelitis and he was discharged after 14 days. All household contacts were

asymptomatic. The family had purchased two iguanas (*Iguana iguana*) in October, 1994. Although the patient denied handling the iguanas he reported recently having cleaned their aquarium. Stool samples obtained from both iguanas yielded *Salmonella* Wassenaar.

■ NEW JERSEY

During September, 1994 a 5-month old girl was hospitalized because of an acute illness including vomiting, lethargy and fever.

On admission it was noted she had a bulging fontanelis and stiff neck. Blood cultures and cerebrospinal fluid yield *Salmonella* serotype Rubislaw. She was treated with IV Cefotaxime for *Salmonella* sepsis and meningitis and discharged after 10 days. Other members of the family were asymptomatic. The infant was routinely fed infant formula. Although the family did not own a reptile, the infant frequently stayed at the home of a babysitter where an iguana was kept. Culture of a stool sample from this iguana yielded *Salmonella* Rubislaw. The infant was reported to not have touched the iguana; however the animal was frequently handled by the babysitter and other members of the family.

All members of the babysitter's family were asymptomatic but stool cultures from two members, including a child who had frequently played with and fed the infant, were positive for *Salmonella* serotype Rubislaw.

■ NEW YORK

In December, 1994 a 45 year old man infected with

HIV was hospitalized because of weakness, nausea, vomiting and diarrhea. His CD+4 T-lymphocyte count was less than 50 cell/ μ L. Cultures from blood and sputum samples yielded *Salmonella* serotype Illa 41:z4zz3 (subspecies of *Salmonella arizonae*). He owned Corn snakes (*Elaphe gutatta*) and until shortly before his illness had worked in a pet shop where he handled reptiles frequently. *Salmonella* sepsis was diagnosed and he was treated with oral ciprofloxacin.

■ NORTH CAROLINA

During December 1994 a 2-day old boy born 8 weeks prematurely developed respiratory difficulties, was diagnosed with a pneumothorax and was transferred to a referral hospital. Blood obtained at birth for culture had been negative but blood obtained 9-days later because of an elevated white blood count yielded *Salmonella* serotype Kintambo. He was treated with intravenous ampicillin for *Salmonella* sepsis and was discharged from the hospital after 30 days.

Eleven days after the positive culture was collected, *Salmonella* Kintambo was cultured from a blood sample obtained from a 12-day old acutely ill boy who was born at 28 weeks gestation and had shared a room at the referral hospital with the first infant. The second infant was treated with intravenous cefotaxime for *Salmonella* and was discharged after 44 days. Both infants had been in the hospital continuously from birth to onset of illness. The mother of the first infant reported having a diarrhoeal ailment 4 days before the birth of the infant. She reported frequently handling a Savannah Monitor lizard (*Varanus exanthematicus*) that the family had purchased in September 1994 and kept in a cage in the kitchen. Culture of a stool sample from the lizard yielded *Salmonella* serotype Kintambo. The second family did not own a reptile.

■ OHIO

During January 1994 a 6-week old boy was hospitalized because of diarrhea, stiff neck and fever. Culture of blood samples and cerebrospinal fluid yielded *Salmonella* serotype Stanley. The infant was treated with intravenous cefotaxime for *Salmonella* sepsis and meningitis and discharged from the hospital after 56 days. He had been fed only formula and had not attended a child care facility. Household contacts were asymptomatic. The family had purchased a 4-inch aquatic turtle (Species not given) in April 1993. A culture of stool from the turtle yielded *Salmonella* Stanley.

Although the infant had not had contact with the turtle, other family members did and the turtle's food and water bowls were washed in the kitchen sink.

■ PENNSYLVANIA

During October 1994 a 21 day old girl was hospitalized because of an illness that included vomiting, bloody diarrhea and fever. She received empirical treatment with intravenous ampicillin. A culture of stool yielded *Salmonella* serotype Poona. She was discharged from the hospital after 11 days. Other members of the family were asymptomatic. The infant had been fed infant formula and had not attended a child care facility. The family owned an iguana and a culture of stool sample from the animal yielded *Salmonella* serotype Poona. Although the infant had no contact with the iguana, it was handled frequently by her mother and other family members.

In addition to the six states highlighted above, seven other states (California, Colorado, Florida, Illinois, Minnesota, Oregon and Utah) have reported recent isolation of the same *Salmonella* serotype from household reptiles as found in patients diagnosed with Salmonellosis. At least one newborn infant has died as a result of reptile associated salmonellosis infection

obtained from a prenatal infection in the mother. Several states have issued alerts and have asked dealers and pet shops to post warnings on this problem as well as recommendations for preventing Salmonellosis both in handlers of the reptiles and non-handling household members.

Direct contact does not appear to be necessary in order to become infected as many of the above cases demonstrate. Copies of these alerts should be given to all persons owning or contemplating ownership of any reptile.

■ GENERAL COMMENTS

For most of the cases described in the above report the identification of rare *Salmonella* serotypes in persons who had no other apparent exposures was linked to direct or indirect contact with a pet reptile from which the same serotype was isolated. In addition these cases are consistent with previous reports indicating that direct contact with a reptile is not necessary for transmission of *Salmonella*. This report also illustrates the severe complications of *Salmonella* infection that can occur in young children, immunocompromised persons and infants in the peripartum period.

Reptiles are popular pets in the United States. An estimated 7.3 million pet reptiles are owned by approximately 3% of all U.S. households according to G. Mitchell in a Pet Industry Joint Advisory Council statement (personal communication). Because the most popular reptile species will not breed if closely confined, most reptiles are captured in the wild and imported. (note: most of the pet iguanas sold in the U.S. have either been captured in the wild or have been bred in farming/ranching operations in Central America and as such are liable to infection with *Salmonella*.)

The number of reptiles imported into the United States has increased dramatically since 1986 and primarily

reflects importation of green iguanas (*Iguana iguana*) which numbered 127,806 in 1986 and 798,405 in 1993 according to M. Albert of the U.S. Fish and Wildlife Service (personal communication - June, 1994).

■ WHAT IS SALMONELLOSIS?

"Salmonellosis is a zoonosis of worldwide economic importance in humans and animals.

Infection of animals with various species of *Salmonella* sometimes results in serious disease and always constitutes a vast reservoir for the disease in humans. The interplay of *Salmonella* with its host takes a variety of forms including remarkable host specificity, unapparent infections, recovered carriers, enteritis, septicemia, abortion, and combinations of disease syndromes. *Salmonella* are readily transferred from animal to animal, animal to humans, and human to human by direct or indirect pathways."

Routes of transmission and other sources of salmonellosis

-The most common route of infection is through oral ingestion.

-Infection can occur through an open cut, sore or wound into the bloodstream.

-Infection can occur through splashing of contaminated material into the eyes.

-Infection can occur through inhalation of sprayed contaminated solutions/aerosols.

-Animals and animal products are the most common sources of infection.

-Improperly cooked meats, especially poultry and chopped beef/pork/turkey.

-Recontamination of cooked meats through contact with raw meats/fluids.

-Contamination of foods by salmonella contaminated hands of servers/preparers.

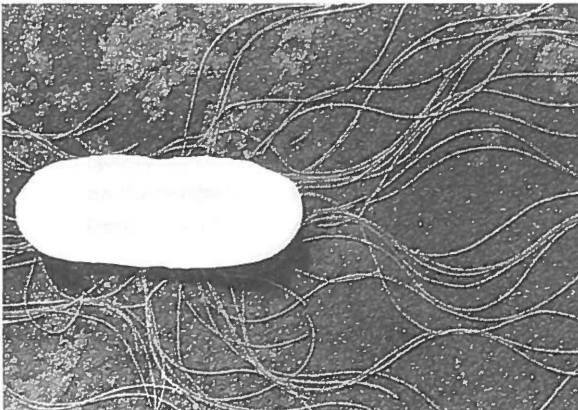
- Contact with, ingestion or inhalation of soil contaminated with animal faeces.
- Raw milk (especially among farm families) and contaminated pasteurized milk.
- Fish meal, bone meal and meat meal; fertilizers and animal feeds.

■ WHO SHOULD AVOID CONTACT WITH REPTILES?

The following categories of people should avoid all contact, direct or indirect, with any reptile as the risks of serious, symptomatic infection with *Salmonella* is greatly increased:

- Infants and children up to 5 years of age.
- Anyone with HIV/AIDS or other immunodeficiency disorders.
- Anyone who has had transplant surgery and is on anti-rejection therapy.
- Anyone who is on any drug which suppresses/alters immune function including: steroids, cancer chemotherapy, biological response modifiers and others.
- Anyone receiving radiation treatment.
- Women who are pregnant due to risk to the fetus.

Salmonella bacterium, magnification $\pm 10.000x$



- Elderly, frail or people with poor nutritional status.

If in doubt about any condition or treatment you or a household member is undergoing consult your physician as to its effect on immune status. If in doubt about any disease or disorder you or a household member may have with respect to its effect on immune status also discuss this with your physician.

Consult your physician if you or any family member develops diarrhea which lasts for more than a day.

■ WHAT TO DO TO AVOID BECOMING INFECTED OR ACTING AS A CARRIER

- After handling any reptile be sure and wash hands with soap/hot water. Wash thoroughly for at least 30 seconds; an antibacterial soap is preferable. Washing with water only is ineffective in eliminating *Salmonella*.
- Keep reptiles out of kitchens and away from any surfaces where human food is stored, prepared or served.
- Do not use kitchen sinks to clean reptile accessories or caging materials.
- Do not touch food for human consumption after handling any reptile or their accessories.
- Do not touch dishes, pots, pans or other utensils used for human food after touching any reptile or reptile accessory.
- Keep reptile enclosures, water/food bowls and surfaces as clean as possible.
- Do not permit unsupervised handling of reptiles by children under 12 years old. Teach children to wash hands thoroughly after handling any reptile.
- Do not handle any reptile or their caging materials with open cuts, lesions (sores) on ones hands unless such cuts are well covered with dressings; rubber gloves are recommended.
- When washing reptile enclosures/accessories avoid

splashes to face.

-If splashing and frequent handling is unavoidable consider wearing goggles and face-mask protection as well as surgical gloves.

-Do not use bathtubs or shower stalls for reptile-related operations unless thoroughly disinfected afterwards.

-Consult your pharmacist, physician, veterinarian or other health or pet care professional for recommendations on soaps and other products useful for disinfecting hands and surfaces.

-Reptiles should not be kept in any child-care facility where toddlers and pre-schoolers are cared for.

-Reptiles kept in classrooms should not be handled unless appropriate handwashing and clean-up facilities are available and made accessible to children and staff.

Disinfectant lotions, pump sprays or similar products should be carried whenever reptiles are going to be handled in the field, at swap meets or other locations where handwashing facilities may be absent.

■ IF YOU HAVE TO USE THE KITCHEN SINK

Some advice from Melissa Kaplan (E-mail: Melissa458@aol.com).

Most people have a choice of only two types of sinks - bathroom and kitchen. In most homes the kitchen sink is the largest of the two and usually has more counter space on either side than bathroom sinks if you do use your bathroom sink be sure and clear away rinsing cups, denture containers, toothbrushes and toothpaste tubes. Stow them where they won't get splashed. But most people will end up using the kitchen sink. If this is the case be sure to put away all utensils, glasses, cups, plates, food humans are going to eat, coffee makers, toasters, can openers --- just clear them all

away and store where these items won't get contaminated. After you're finished be sure to wash and disinfect the sink, taps and surfaces you used. Here are a few tips: use two sets of sponges and gloves (one for human application, the other for animal); keep spray bottles of prepared disinfectant on the counter for immediate use in spraying down the sink and counter after a cleaning session. I also keep bottles of prepared simple "Green Soap" and Nolvasan (tm) in my snake room and iguana room, along with paper towels, so I don't have to keep going back and forth to the kitchen --- keeping it convenient if not actually completely simple -- often goes a long way toward the task getting done and done properly.

■ WHAT THE HERPETOLOGICAL COMMUNITY SHOULD DO ABOUT SALMONELLOSIS

Reptile-associated salmonellosis is, day-by-day, capturing the attention of public health officials, the medical profession, legislators and the media. It is up to the herpetological community -- professional herpetologists, herpetoculturists, zoo professionals, veterinarians, hobbyists, the pet trade, mail order reptile suppliers --- anyone who is at all involved with reptiles to help stop the continuing proliferation of reptile-associated salmonellosis before public health officials will have no choice but to impose the same kinds of bans and prohibitions already in place for baby turtles. The information presented in this document has been designed to educate the educator as well as to be disseminated throughout the herpetological community of interests. If we all want to continue in our occupations it is essential we get out and distribute this information as well as to insure the enforcement of a few simple recommendations. As a start we recommend the following steps be taken:

Download and print out copies of this document. Hand them out free to pet shops, reptile dealers, reptile customers, hobbyists at local herp society meetings, swap meets, conferences, seminars, mail order customers and to anyone you know who is involved with reptiles as a hobby or occupation. Encourage contacts to, in turn, copy these pages and hand them out to others. Start a grass roots campaign of getting this information into the hands of people who need to be aware of it. You will not only be stemming the incidence of a serious zoonotic disease, especially among infants and small children but you will also be helping to protect your hobby or occupation from legislative interference and onerous (but often necessary) public health enforcement.

You and only you can help put an end to the "situation". The expense, time and effort you devote to this endeavour will be amply rewarded in ways that cannot be measured in mere dollars and cents.

This will also be a test of the power of Internet-connected herpers to reach out and affect those who do not have access to the WorldWideWeb. In 1970 this powerful tool was not available so we stood by and watched the turtle legislation go into effect. The power of the Internet has helped to topple the Soviet Union's dictatorship and bring down the Berlin Wall. It can surely be a tool to stop an epidemic.

■ COMMON QUESTIONS

Many people in herpetology ask why they should be concerned about this issue when the vast majority of Salmonellosis infections come from sources other than reptiles. The reason is simple. While this statement may be true, reptiles still constitute a proven and significant source of infection; even if they represent only a small percentage of all the cases they still represent a visible

target for public health and lawmakers to go after. Hundreds of thousands of infants and toddlers became ill with turtle-associated salmonellosis in the 1960's and 1970's. While these cases may have been only a small percentage of the millions of total Salmonellosis cases they still were a significant number. The fact that infants and toddlers were involved made their numbers all the more visible. Reptile-associated salmonellosis is an issue that concerns the herpetological community and can be dealt with successfully.

Comments, questions and suggestions regarding this document should be sent to: grenard@con2.com

■ LITERATURE

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["http://www.xmission.com/~gastown/herpmed/"](http://www.xmission.com/~gastown/herpmed/) Herpmed's

HomePage

"<http://www.cdc.gov/>" Centers for Disease Control

- *The case histories are adapted from the Morbidity and Mortality Weekly Report published by the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, U.S.A.*

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