Salmonella Michigan soft tissue infection in an immunocompromised child

A Hames, J Mumford, J Hale, et al.

J Clin Pathol 2008 61: 773-774 originally published online March 6, 2008
doi: 10.1136/jcp.2007.050468

Salmonella Michigan soft tissue infection in an immunocompromised child

A Hames,[1] J Mumford,[2] J Hale,[2] A Galloway[1]

[1] Department of Microbiology, Royal Victoria Infirmary, Newcastle-upon-Tyne, UK; [2] Department of Child Health, Newcastle General Hospital, Newcastle-upon-Tyne, UK

Correspondence to: A Hames, Department of Microbiology, Royal Victoria Infirmary, Queen Victoria Road, Newcastle-upon-Tyne NE1 4LP, UK; ali.hames@fivequarters.com

Accepted 5 February 2008
Published Online First 6 March 2008

ABSTRACT

A rare case of soft tissue infection due to *Salmonella* Michigan in an immunocompromised child is reported. The same organism was isolated from a tortoise kept in the home. Immunocompromised patients are especially susceptible to reptile-associated salmonellosis and should be advised appropriately.

A 12-year-old boy was diagnosed in October 2005 with a low-grade glioma. As the tumour was non-resectable, he commenced chemotherapy with vincristine and carboplatin in November 2005. He required a syringoperitoneal shunt, further chemotherapy with vincristine, cyclophosphamide and cisplatin, and subsequently temzolamide and radiotherapy. In September 2006 he then required a further syringoperitoneal shunt to control symptoms. Soon after the shunt was inserted he became neutropenic, but his neutrophil counts rose in the following few weeks to between 4×10^9/l and 5×10^9/l.

The boy then developed a non-erythematous swelling at the lateral edge of the abdominal wound of the most recent cervical syringoperitoneal shunt. This area subsequently became inflamed and discharged pus. Swabs were sent to Microbiology for culture and were plated onto blood agar and chocolate agar (incubated aerobically for 24 h in 5% carbon dioxide at 37°C), and a nalidixic acid blood agar plate (incubated anaerobically at 37°C) for 48 h. Cultures of two successive wound swabs revealed a growth of *Klebsiella pneumoniae* and *Salmonella* ser. Michigan. Both isolates were identified initially using API 20E (bioMérieux, Basingstoke, UK). The *Salmonella* isolate was sent to the Health Protection Agency (HPA) Enteric Pathogens Division, Colindale, London, UK, for further identification. Sensitivity testing was performed on each isolate using the British Society for Antimicrobial Chemotherapy method, and each was found to be sensitive to ciprofloxacin, amoxicillin, cefuroxime and ceftazidime. The boy was treated with flucloxacillin (orally, 1 g 6 hourly) and ciprofloxacin (orally, 500 mg 12 hourly) for 2 weeks and subsequent wound swabs taken after 4 days of treatment showed no growth. The wound area, however, took several weeks to heal. It is advised that ciprofloxacin should be used with caution in children;[1] this agent was chosen as it has good activity against *Salmonella* spp and has been used to clear faecal carriage,[2] and it is an agent that is used commonly in children of this patient's age.

Other medical history of note included chronic eczema, and since being on treatment he has had numerous staphylococcal skin and line infections complicated by bacteraemias.

The patient reported no gastrointestinal symptoms or known infectious contacts prior to the development of the wound infection, and faecal culture was negative for *Salmonella*. Family members were not tested for faecal carriage. Further history revealed that the family had several pets including dogs, chickens, alpacas, a parrot, a pig and a tortoise. The patient had been on several periods of home leave while an inpatient but denied having direct contact with these animals. Faeces samples from the chickens, parrot, pig and tortoise were obtained for enteric culture, and plated onto xylose lysine deoxycholate agar (XLD), deoxycholate citrate agar and enriched in selenite broth before subculture to XLD (all incubated aerobically at 37°C). A *Salmonella* species was isolated from the faeces of the tortoise and sent to the HPA Enteric Pathogens Division for identification, and it revealed *Salmonella* Michigan. No other *Salmonella* spp was isolated from the other animals.

As the patient was not found to be a faecal carrier, infection was probably as a direct result of hand contamination of the wound in a patient with damaged skin due to eczema and previous staphylococcal infection.

DISCUSSION

Salmonella enterica subsp. *enterica* serovar Michigan (serotype I 17:1, v:1,5) was first described in Michigan by Juenker and Caldwell[3] (cited in oral communication, E de Pinna, HPA, 8 December 2006). It is a rare cause of human salmonellosis, isolated infrequently from human sources in the USA but not previously reported from animal sources.[4 5] It has not previously been reported in the UK (oral communication, E de Pinna, 8 December 2006). There have been no reports since it was first described.

Salmonella enterica is a known cause of skin and soft tissue infection; focal infection typically results from bacteraemia following gastrointestinal infection.[6–8] However its occurrence in the absence of gastrointestinal infection is rare and is almost exclusively associated with immune compromise.[7] Two cases have been described of soft tissue infection without gastrointestinal symptoms in otherwise healthy children.[8 9]

The incidence of reptile-associated salmonellosis is well documented. It is thought that over 90% of all reptiles carry *Salmonella* spp, usually asymptomatically,[10] and are often colonised with rare serotypes such as Java, Marina, Stanley, Poona and Chameleon.[11] As a proportion of overall cases

Take-home messages

- Reptiles may carry unusual subspecies of *Salmonella enterica*.
- Children receiving cancer chemotherapy may not be warned of the dangers of having reptilian pets, despite guidance in the USA and warnings in the UK.
- Salmonella infection may occur in wounds without gastroenteritis.
- This is the first report of *Salmonella enterica* subsp. *enterica* serovar Michigan in the UK.

of human salmonellosis, rates of reptile-associated infection have been reported as high as 7%.[11] Serious sequelae may result from invasive infection, especially in young children, pregnant women and the immunocompromised, such as septicaemia, meningitis and spontaneous abortion. These sequelae, which may occur with any form of salmonellosis, are more common in reptile-associated disease. Transmission may arise from direct contact with the animal, or from indirect contact with family members or with the reptile's droppings. Poor hand hygiene has a role to play in the spread of infection. Infection has been shown to be independently associated with both direct contact with the animal and with having a reptile or amphibian in the home.[13] Attempts to eliminate carriage in reptiles with antibiotics have been unsuccessful.[12]

In the early 1970s, reptile-associated salmonellosis accounted for around 18% of all cases of salmonellosis in children in the USA,[13] with around 15 million turtles being sold per year.[14] In the USA, the Food and Drug Administration banned commercial distribution of small turtles in 1975 due to increasing public health concerns, resulting in a reduction of around 100 000 cases.[11] It was thought that larger turtles posed a lesser threat, as children are unable to fit them in their mouths.[15] However, a more recent increase in the rates of infection prompted the Centers for Disease Control and Prevention to issue guidelines around contact with reptiles and amphibians, and it has recommended that immunocompromised patients and young children avoid contact and do not keep such animals in their homes.[10 16]

This case report highlights the importance of infection control procedures in the home to prevent infection in immunocompromised patients. Advice needs to be given to parents and older children regarding avoiding handling such pets when immunocompromised, and hand hygiene if contact occurs. The importance of cross-infection from other family members also needs to be highlighted. Advice is given on our oncology unit regarding such issues by way of an information leaflet and informal discussion once an initial diagnosis has been made.

This rare serotype of *Salmonella* has not previously been described in reptile-associated disease; practitioners should be aware of the risks to children and immunocompromised patients from contact with reptiles, and advise on appropriate infection control practices in the home.

Competing interests: None.

Patient consent: Informed consent has been obtained for the publication of the details in this report.

REFERENCES

1. **British National Formulary**. 54th edn. London: BMJ Publishing and RPS Publishing, 2007.
2. **Nathwani D,** Wood MJ. Ciprofloxacin and salmonella carriage. *J Hosp Infect* 1992 Nov; **22**:181–4.
3. **Juenker A,** Caldwell W. A new *Salmonella* type: *Salmonella* Michigan. *Public Health Lab* 1955;**13**:66–7.
4. **Centers for Disease Control and Prevention**. *Salmonella* surveillance annual tabulation summary 2001. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, 2001.
5. **Centers for Disease Control and Prevention**. *Salmonella* surveillance annual tabulation summary 2004. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, 2004.
6. **Pegues DA,** Ohl ME, Miller SI. *Salmonella* species, including *Salmonella* Typhi. In: Mandell GL, Bennett JE, Dolin R, eds. *Principles and practice of infectious diseases*. 6th edn. Philadelphia, PA: Churchill Livingstone, 2004.
7. **Vajo Z,** Szekacs B, Hitre E, *et al*. Supraclavicular abscess caused by *Salmonella enteritidis* in patient without gastrointestinal symptoms. *Wien Klin Wochenschr* 1998;**110**:802–3.
8. **Porcalla AR,** Rodriguez WJ. Soft tissue and cartilage infection by *Salmonella oranienburg* in a healthy girl. *South Med J* 2001;**94**:435–7.
9. **Minohara Y,** Kato T, Chiba M, *et al*. A rare case of *Salmonella* soft-tissue abscess. *J Infect Chemother* 2002;**8**:185–6.
10. **Ward L.** Salmonella perils of pet reptiles. *Commun Dis Public Health* 2000;**3**:2–3.
11. **CDC**. Reptile-associated salmonellosis – selected states, 1996–98. *MMWR Morb Mortal Wkly Rep* 1999;**48**:1009–13.
12. **CDC**. Reptile-associated salmonellosis – selected states, 1998–2002. *MMWR Morb Mortal Wkly Rep* 2003;**52**:1206–9.
13. **Mermin J,** Hutwagner L, Vugia D, *et al*. Reptiles, amphibians and human salmonella infection: a population-based, case–control study. *Clin Infect Dis* 2004;**38**(Suppl 3): S253–61.
14. **Ackman DM,** Drabkin P, Birkhead G, *et al*. Reptile-associated salmonellosis in New York State. *Pediatr Infect Dis J* 1995;**14**:955–9.
15. **Hampton T.** Salmonella risk from turtles. *JAMA* 2004;**291**:415.
16. **Association of Reptilian and Amphibian Veterinarians**. *Salmonella* bacteria and reptiles: client educational handout. 2007. http://www.arav.org/SalmonellaOwner.htm (accessed 14 March 2008).