# Salmonella meningitis and septicaemia in an nonimmunocompromised adult, associated with a cluster of Salmonella Enteritidis PT 14b, Ireland, November 2009

#### C O ÓhAiseadha (coilin.ohaiseadha@hse.ie)<sup>1</sup>, Ó M Dunne<sup>2</sup>, F Desmond<sup>3</sup>, M O'Connor<sup>1</sup>

- 1. Department of Public Health, Health Service Executive Eastern Region, Dublin, Ireland
- 2. Department of Medicine and Therapeutics/Nephrology, Division of Medicine, Mater Misericordiae University Hospital, Dublin, Ireland
- 3. Department of Intensive Care Medicine, Division of Anaesthesia, Mater Misericordiae University Hospital, Dublin, Ireland

#### Citation style for this article:

Citation style for this article: ÓhAiseadha CO, Dunne ÓM, Desmond F, O'Connor M. Salmonella meningitis and septicaemia in an non-immunocompromised adult, associated with a cluster of Salmonella Enteritidis PT 14b, Ireland, November 2009. Euro Surveill. 2010;15(7):pii=19489. Available online: http://www. eurosurveillance.org/ViewArticle.aspx?ArticleId=19489

This article has been published on 18 February 2010

We report a fatal case of meningitis caused by Salmonella Enteritidis phage type 14b in a middleaged man who had no history or findings to suggest he was immunocompromised. To our knowledge, this is the first reported case of Salmonella meningitis in an adult in Ireland, and the first case of meningitis in an adult caused by phage type 14b. This case was associated with a nationwide cluster of salmonellosis which is still under investigation at the time of writing.

## Introduction

Salmonella infection is recognised as a common cause of gastroenteritis which can result in large outbreaks [1]. Acute bacterial meningitis is a rare manifestation of Salmonella infection, and when it does occur, it is most commonly a disease of infants [2,3]. In adults, Salmonella meningitis, although rare, is most commonly seen in patients with impaired immunity, particularly in infection with human immunodeficiency virus (HIV) [4,5].

In this report, we describe a case of a non-immunocompromised adult with Salmonella Enteritidis meningitis and severe sepsis, with a rapid onset and a fatal outcome, that occurred in Dublin in November 2009.

This case is one of a cluster of at least 15 cases of Salmonella Enteritidis phage type 14b infection in Ireland that started in October 2009 [6; Health Protection Surveillance Centre, personal communication]. This variant has also been implicated in over 443 cases, including 14 outbreaks, in the United Kingdom since August 2009 [7,8].

## **Case description**

The patient was a man in his late 40s who had a stable chronic mental illness and lived in a community psychiatric hostel in an urban area, supervised by 24-hour nursing staff. His regular medications included clozapine, amisulpride and valproate. Regular blood tests

for potential side effects such as agranulocytosis did not show any abnormalities. He was a regular smoker. There was no abuse of alcohol or intravenous drugs and no known risk factors for HIV infection.

The patient woke in the early morning hours with a headache, which was relieved by treatment with 1 g paracetamol. After a quiet night he was found agitated and feverish six hours later. He was seen by a doctor and, due to rapid deterioration, was transferred by ambulance to the nearby acute hospital as an emergency with a seven-hour history of headache and a two-hour history of fever (38.5 °C), rigors, inability to stand and progressive reduction in level of consciousness. He was admitted to the intensive care unit on the same day.

On admission, a lumbar puncture revealed turbid cerebrospinal fluid, with a milky-brown colour. Three samples of cerebrospinal fluid (CSF) were taken at the time of admission. All of them showed a white blood cell count of >5,000 and a red blood cell count of zero. Microscopy of the CSF, performed urgently, showed abundant Gram-negative bacilli. A blood sample taken on admission showed a leukocyte count of  $8.97 \times 10^{9}$ /L, with a neutrophil count of 8.13 x  $10^{9}$ /L. Plasma urea, electrolytes, liver enzymes, total protein and albumin concentration were all within the normal range at that time.

A progressive neutrophilia was documented, with a count of 17.73 x 10<sup>9</sup>/L on day 2, rising to 31.61 x 10<sup>9</sup>/L on day 4 of hospitalisation. The patient developed acute renal failure on day 2 of hospitalisation.

The patient received one dose of 2 g cefotaxime and 2.4 g benzylpenicillin in the emergency department. After Gram-negative organisms were identified in the CSF samples taken on admission, this treatment was discontinued and the patient received 2 g meropenem

three times a day and 1 g vancomycin twice a day for the following three days. On day 4 of hospitalisation, cultures from the CSF samples and a series of three blood samples taken on the day of admission grew *Salmonella* sensitive to cefotaxime, and the patient's treatment was changed to 1 g cefotaxime every four hours.

In view of known association between *Salmonella* meningitis in adults and immunodeficiency, and despite the absence of risk factors, the patient was tested on day 5 for HIV, hepatitis B virus and hepatitis C virus infections, all of which were negative. Nor were there any incidental clinical signs, radiographic or laboratory findings to suggest underlying malignancy or opportunistic infection.

Despite treatment with appropriate antibiotics and interventions to support failing organ systems, he deteriorated and died five days after admission. The final *post mortem* report was not available at the time of writing this report.

## **Environmental investigation**

In view of the fatal outcome, and despite the fact that no staff member or resident at the hostel had a history of gastroenteritis, stool samples from staff and fellow residents were obtained as part of the public health investigation. In addition to testing samples of food, eggshells and water from the hostel, other food premises where the patient was known or thought to have eaten were inspected, foods sampled and distribution chains traced. Particular attention was paid to foods containing chicken, eggs or egg products of any kind. None of the dozens of stool or food samples grew *Salmonella*.

The *Salmonella* species involved was nalidixic acidresistant *Salmonella* Enteritidis phage type 14b. The same phage type has been identified in a cluster of cases notified to Irish departments of public health since November 2009, all of whom had gastro-enteritis alone and made a full recovery [6]. As with the above case, meticulous tracing of relevant foods through the distribution chains was and is being conducted for all cases, but to date the source of infection has not been identified.

## Discussion

Human *Salmonella* infection is categorised into four manifestations: enteric infections, sepsis, non-enteric focal infections (including meningitis) and a chronic carrier state [3]. Bacterial meningitis is characterised by acute onset of fever, headache and one of the following signs: neck stiffness, altered consciousness or other meningeal signs [9].

The first case of *Salmonella* meningitis in the literature was reported in 1907 by Ghon [10]. In a study of 7,779 infections identified at the New York *Salmonella* Centre, meningitis accounted for only 0.8% [3]. In adults, *Salmonella* meningitis is most commonly seen in patients with intercurrent illness [11,12], including particularly immunosuppression associated with HIV [4,5].

Irish legislation requires doctors to send notifications of infectious diseases, including Salmonella infections, to medical officers of health in regional public health departments. Notification of bacterial meningitis from any cause must also be given. These data are collated at the national level by the Health Protection Surveillance Centre (HPSC). In a review of national data for the ten-year period from 2000 to 2009, the number of notifications of bacterial meningitis in Ireland was 1,229 and the number of notifications of *Salmonella* infection was 4,395, including 88 cases of typhoid and/or paratyphoid. The data from this period include only one case of Salmonella meningitis, a three-weekold baby with S. Dublin (medical officer of health, personal communication). Before this period, Foley *et al*. published in 1980 one series of three cases of childhood *Salmonella* meningitis in Ireland; all were infants [13].

Of all *Salmonella* infections listed in 2008 in the database of enteric infections collected by Enter-net, the European surveillance network for human gastrointestinal infections, *Salmonella* Enteritidis was by far the most common serotype, while S. Typhi, Oranienburg, Paratyphi and Berta were not listed among the top ten [14]. However, the European literature includes only two previous case reports of adults with meningitis due to *Salmonella* Enteritidis, one of whom was immunocompromised [15,16]. Other cases of *Salmonella* meningitis in adults previously reported in the literature have involved a diversity of serotypes, including at least 19 cases of S. Typhi [17-22], two cases of S. Typhimurium [18,11], and one case each of S. Oranienburg [23], S. Virchow [24], S. Paratyphi [21] and S. Berta [25].

The case described here is the only notified case of *Salmonella* meningitis in an adult in Ireland in the last ten years, and the first published adult case in Ireland. Kauffman *et al.* reported that *Salmonella* meningitis, arising in association with a variety of serotypes, may present without preceding symptoms of gastroenteritis [11], as was also true in our case.

There were no clinical signs, laboratory or radiographic findings to suggest a compromised immune system in this case. While agranulocytosis is a recognised adverse effect of clozapine, the fact that the patient's white blood cell count was monitored regularly and that he developed a marked neutrophilia indicates that this was not a factor.

## Conclusion

We describe the first reported case of *Salmonella* meningitis in an adult in Ireland, who was not immunocompromised. The association of this fatal case with a phage type that has also been implicated in a large number of sporadic cases and several recent outbreaks in the United Kingdom indicates the need for continuing vigilance in terms of surveillance and investigation to reduce the risk of further such infections with *Salmonella* Enteritidis PT 14b.

#### Acknowledgements

We would like to thank the Departments of Public Health, the Department of Microbiology, Department of Intensive Care Medicine and other staff at Mater Misericordiae University Hospital, the National Salmonella Reference Laboratory, Environmental Health Officers of the Communicable Diseases Unit and regional offices, the Food Safety Authority of Ireland and the Health Protection Surveillance Centre for their assistance.

#### References

- Hawker J, Begg N, Blair I, Reintjes R, Weinberg J. Salmonellosis. In: Communicable Disease Control Handbook, 2nd ed. Massachusetts: Blackwell Publishing; 2005. p. 193.
- Beene ML, Hansen AE, Fulton M. Salmonella meningitis; recovery from meningitis due to Salmonella sp. (type Montevideo), with consideration of the problem of Salmonella meningitis. AMA Am J Dis Child. 1951;82(5):567–73.
- Saphra J, Winter JW. Clinical manifestations of salmonellosis in man: an evaluation of 7779 human infections identified at the New York Salmonella Center. N Engl J Med. 1957;256(24):1128-34.
- 4. Leonard MK, Murrow JR, Jurado R, Gaynes R. Salmonella meningitis in adults infected with HIV: case report and review of the literature. Am J Med Sci. 2002;323(5):266-8.
- 5. Fraimow HS, Wormser GP, Coburn KD, Small CB. Salmonella meningitis and infection with HIV. AIDS. 1990;4(12):1271-3.
- Garvey P, McKeown P. Nationwide salmonella cluster under investigation. Epi-Insight. 2010;11(1). Available from: http:// ndsc.newsweaver.ie/newepiinsight/bcs3yskeslt-i8xmmjicne
- Health Protection Agency. National increase in Salmonella Enteritidis phage type 14b NxCpl infections in England – an update. Health Protection Report. 2009;3(47). Available from: http://www.hpa.org.uk/hpr/archives/2009/news4709.htm
- Update on investigation into increase in salmonella. London: Food Standards Agency; 18 January 2010. Available from: http://www.food.gov.uk/news/newsarchive/2009/dec/ salmonellaupdate
- 9. Vaccine Assessment and Monitoring team of the Department of Vaccines and Biologicals. Bacterial meningitis (including Haemophilus influenzae type b (Hib), Neisseria meningitidis, and Streptococcus pneumoniae) In: Vaccines and Biologicals. WHO-recommended standards for surveillance of selected vaccine-preventable diseases. Geneva: World Health Organization; 2003. Available from: http://www.who.int/ vaccines-documents/DocsPDFo6/843.pdf
- Ghon J. Bericht über den XIV. Internationalen Kongress für Hygiene und Demographie (Berlin). [Report on the XIVth international congress for hygiene and demographics (Berline)]. 1907 volume 4. p. 21. German.
- 11. Kauffman CA, St. Hilaire RJ. Salmonella meningitis. Occurrence in an adult. Arch Neurol. 1979;36(9):278-80.
- Cherubin CE, Marr JS, Sierra MF, Becker S. Listeria and Gramnegative meningitis in New York City 1972-1979. Am J Med. 1981;71(2):199-209.
- 13. Foley BV, Doyle CT. Salmonella meningitis. Ir Med J. 1980;73(3):125-7.
- 14. Rudbeck Jepsen M, Fisher I, Galle M, Bang H, Ethelberg S. Creating an online atlas of Salmonella serotypes in Europe. Euro Surveill. 2008;13(3):pii=8016. Available from: http:// www.eurosurveillance.org/ViewArticle.aspx?ArticleId=8016
- 15. Baccarani M, Fiacchini M, Galieni P, Gherlinzoni F, Fanin R, Fasola G, et al. Meningitis and septicaemia in adults splenectomized for Hodgkin's disease. Scand J Haematol. 1986;36(5):492-8.
- 16. Pasquier F, Catanzariti JF, Petit H. Meningitis caused by Salmonella Enteritidis in an adult. Acta Clin Belg. 1992;47(3):215-6.

- Chanmugam D, Machado V, Mihindukulasuriya JC. Primary Salmonella typhi meningitis in an adult. Br Med J. 1978;1(6106):152.
- Chhina RS, Gupta BK, Wander GS, Kurana SB, Chawla LS. Chloramphenicol resistant salmonella meningitis in adults - a report of 3 cases. J Assoc Physicians India. 1993;41(8):535.
- 19. Giri OP. Study of cerebrospinal fluid in Salmonella typhi meningitis. J Assoc Physicians India. 1993;41(3):154.
- 20. Lecour H, Santos L, Oliveira M, Pereira A, Simões J. Salmonella typhi meningitis. Scand J Infect Dis. 1994;26(1):103-4.
- 21. Karim M, Islam N. Salmonella meningitis: report of three cases in adults and literature review. Infection. 2002;30(2):104-8.
- 22. Gonen I, Akcam FZ, Meningitis owing to an unusual aetiological agent in an adult: Salmonella typhi. Scand J Infect Dis. 2005;37(4):319-20.
- 23. Hardy C, Bansal A, Lowes JA, George CF. Salmonella meningitis following treatment of enteritis with neomycin. Postgrad Med J. 1984;60(702):284-6.
- 24. Gille-Johnson P, Kövamees J, Lindgren V, Aufwerber E, Struve J. Salmonella virchow meningitis in an adult. Scand J Infect Dis. 2000;32(4):431-3.
- 25. Carr BG, Weisbein JL, Gaieski DF. Salmonella meningitis in an immunocompetent adult. J Emerg Med. 2008;Jun 3 [Epub ahead of print]. DOI:10.1016/j.jemermed.2007.11.046.