

# *Salmonella enterica* Serovar Virchow Bacteremia Presenting as Typhoid-Like Illness in an Immunocompetent Patient<sup>▽</sup>

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**We report a typhoid-like illness with fever and altered consciousness in a 22-year-old man with growth of *Salmonella enterica* serovar Virchow in blood and stool culture. Bacteremia and invasive disease due to non-typhoid salmonellae (NTS) are known in severely immunocompromised patients, but so far have not been described in immunocompetent adults.**

## CASE REPORT

A 22-year-old Caucasian man presented to our outpatient clinic 2 days after returning from a 2-week visit to Bangkok, Thailand, with a 6-day history of fever, head and neck pain, body aches, constipation, loss of appetite, and nausea.

On physical examination, the patient appeared ill and sleepy, with a body temperature of 39.4°C. His blood pressure was 150/80 mm Hg, and relative bradycardia of 80/min was found. The right lower abdomen was painful on palpation, and bowel sounds were increased.

Initial laboratory results showed mild thrombocytopenia with 120,000 platelets/ $\mu$ l, C-reactive protein (CRP) level of 25.4 mg/liter (normal range, <5 mg/liter), and a differential white blood cell (WBC) count of 5,500 cells/ $\mu$ l neutrophils with 6% band cells and 1,200 cells/ $\mu$ l lymphocytes. All other hematological and biochemical tests were within normal limits. Urine examination and serology for hepatitis A, B, C, and E, HIV, Epstein-Barr virus (EBV), Dengue virus, and blood smears for malaria were negative. Abdominal ultrasound and chest X ray were unremarkable, as was a cranial computed tomography (CT) scan because of persisting headache.

Within a day, the patient developed continuous severe frontal headache and an altered level of consciousness, and the CRP level rose to 100 mg/liter. Blood cultures taken on the day of admission grew Gram-negative rods. The German National Reference Laboratory for Salmonella and other Enteric Pathogens, Robert Koch Institute, Wernigerode, Germany, identified *Salmonella enterica* serovar Virchow from the culture by agglutination testing and lysotyping. Resistance against cefuroxime, gentamicin, and tobramycin determined by MIC was found. The patient was put on ciprofloxacin (1,200 mg intravenous [i.v.] 3 times per day [TID]) for 10 days. The patient's altered consciousness and, despite pain control, severe frontal headache persisted. His body temperature was spiking up to 39.2°C to the fourth day of antibiotic treatment.

One week after admission, *S. enterica* serovar Virchow of the

same antibiotic resistance pattern grew in the stool cultures. Additional features of his illness were constipation and weight loss of 6 kg.

On the 6th day after hospital admission, liver enzymes were found to be elevated, with an alanine aminotransferase (ALT) level of 697 U/liter and aspartate transaminase (AST) level of 401 U/liter, but rapidly returned to normal values after discontinuation of paracetamol and ciprofloxacin. The patient made an uneventful recovery and continues to feel well 6 months after discharge from hospital.

Non-typhoid salmonellae (NTS) are ubiquitous Gram-negative bacteria that primarily cause gastroenteritis after ingestion of contaminated food or water. In contrast to *S. enterica* serovars Typhi and Paratyphi, NTS have a broad vertebrate host range and are found in many food animals. The incidence of infection with NTS has increased dramatically in recent decades (12), and NTS are a major cause for morbidity and mortality in both industrialized and developing countries (3, 4).

Most patients infected with NTS have self-limiting gastroenteritis, while invasive disease with bacteremia is seen in only 3 to 8% of patients (8). Risk factors for invasive and complicated NTS disease are severe immunosuppression (10) and the extremities of age. The clinical picture associated with NTS bacteremia differs significantly between adults and children. In a study from Taiwan, children were much more likely to present with diarrhea, while chills were more often observed in adults. Whereas NTS bacteremia is associated with a favorable outcome in children, it can be life-threatening in adults (7). Adult patients with severe immunosuppression, such as HIV and AIDS, diabetes mellitus, malignant or rheumatic diseases, and transplant patients, are particularly at risk for invasive NTS (13). In these patients, NTS bacteremia occurs mostly without gastroenteritis (9). In our patient, no predisposing risk factor was found that could explain the course and severity of the disease.

*S. enterica* serovar Virchow was first described in 1930 as a bacterium that causes gastroenteritis as well as invasive disease (5), but it was considered to be one of the less-invasive NTS. Only recently its potential became apparent in immunocompetent children presenting with a wide spectrum of clinical

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manifestations (1). Unique and remarkable epidemiological features of *S. enterica* serovar Virchow have been seen in Israel over the past 10 years, which has the highest infection rates worldwide (12). A dramatic increase in both blood and stool culture isolates was reported which were highly invasive and resistant to a wide range of antibiotics. *S. enterica* serovar Virchow invasive disease has been reported in patients with severe immunosuppression (2) and in early childhood (10, 11); however, it has not been reported in immunocompetent adults.

The source of infection in our case is unclear. Ingestion in Bangkok is most likely and falls into the range of the incubation period of NTS. Little is known about NTS epidemiology in Thailand. Only one recent study showed marked predominance of *Salmonella* group C as the cause for bacteremia, with up to 30% multidrug resistance and a strong association with HIV infection (6).

To the best of our knowledge, this is the first case of invasive disease presenting as a typhoid-like illness due to *S. enterica* serovar Virchow in an otherwise healthy adult.

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We have no conflicts of interest to disclose.

#### REFERENCES

1. Bitsori, M., E. Galanakis, S. Maraki, M. Raissaki, E. Velivassakis, and S. Sbyrakis. 2001. Invasive *Salmonella* virchow infection in childhood. *Scand. J. Infect. Dis.* **33**:862–865.
2. Gordon, M. A. 2008. Salmonella infections in immunocompromised adults. *J. Infect.* **56**:413–422.
3. Hohmann, E. L. 2001. Nontyphoidal salmonellosis. *Clin. Infect. Dis.* **32**:263–269.
4. Kariuki, S., G. Revathi, N. Kariuki, J. Kiiru, J. Mwituria, and C. A. Hart. 2006. Characterisation of community acquired non-typhoidal *Salmonella* from bacteraemia and diarrhoeal infections in children admitted to hospital in Nairobi, Kenya. *BMC Microbiol.* **6**:101.
5. Kauffmann, F. 1930. Neue serologische Typen der Paratyphusgruppe. *Med. Microbiol. Immunol.* **111**:221–232.
6. Kiratisin, P. 2008. Bacteraemia due to non-typhoidal *Salmonella* in Thailand: clinical and microbiological analysis. *Trans. R. Soc. Trop. Med. Hyg.* **102**:384–388.
7. Lee, S. C., P. H. Yang, W. B. Shieh, and R. Lasserre. 1994. Bacteremia due to non-typhi *Salmonella*: analysis of 64 cases and review. *Clin. Infect. Dis.* **19**:693–696.
8. Mandal, B. K., and J. Brennand. 1988. Bacteraemia in salmonellosis: a 15 year retrospective study from a regional infectious diseases unit. *BMJ* **297**:1242–1243.
9. Ramos, J. M., P. Garcia-Corbeira, J. M. Aguado, R. Arjona, J. M. Ales, and F. Soriano. 1994. Clinical significance of primary vs. secondary bacteremia due to nontyphoid *Salmonella* in patients without AIDS. *Clin. Infect. Dis.* **19**:777–780.
10. Shimoni, Z., S. Pitlik, L. Leibovici, Z. Samra, H. Konigsberger, M. Drucker, V. Agmon, S. Ashkenazi, and M. Weinberger. 1999. Nontyphoid *Salmonella* bacteremia: age-related differences in clinical presentation, bacteriology, and outcome. *Clin. Infect. Dis.* **28**:822–827.
11. Weinberger, M., N. Andorn, V. Agmon, D. Cohen, T. Shohat, and S. D. Pitlik. 2004. Blood invasiveness of *Salmonella enterica* as a function of age and serotype. *Epidemiol. Infect.* **132**:1023–1028.
12. Weinberger, M., and N. Keller. 2005. Recent trends in the epidemiology of non-typhoid *Salmonella* and antimicrobial resistance: the Israeli experience and worldwide review. *Curr. Opin. Infect. Dis.* **18**:513–521.
13. Yen, Y. F., Y. C. Lin, T. L. Chen, Y. Y. Chen, M. L. Lin, F. D. Wang, and C. Y. Liu. 2007. Non-typhoidal *Salmonella* bacteremia in adults. *J. Microbiol. Immunol. Infect.* **40**:227–233.