

5. World Health Organization. *WHO Guidelines on tularaemia*. Geneva, Switzerland: World Health Organization; 2007.
6. Spletstoesser WD, Tomaso H, Al Dahouk S, Neubauer H, Schuff-Werner P. Diagnostic procedures in tularaemia with special focus on molecular and immunological techniques. *J Vet Med B Infect Dis Vet Public Health* 2005;52:249–261.
7. Jones RM, Nicas M, Hubbard A, Sylvester MD, Reingold A. The infectious dose of *Francisella tularensis* (tularemia). *Appl Biosaf* 2005;10:227–239.
8. Tang JW, Li Y, Eames I, Chan PK, Ridgway GL. Factors involved in the aerosol transmission of infection and control of ventilation in healthcare premises. *J Hosp Infect* 2006;64:100–114.
9. Mesner O, Riesenberk K, Biliar N, et al. The many faces of human-to-human transmission of brucellosis: congenital infection and outbreak of nosocomial disease related to an unrecognized clinical case. *Clin Infect Dis* 2007;45:e135–e140.

Port-Related Nontyphoidal *Salmonella* Bacteremia

To the Editor—*Salmonella* species, a genus of the family Enterobacteriaceae, includes *Salmonella enterica* serovar Typhi and nontyphoidal *Salmonella* (NTS) spp.^{1,2} Human infections caused by NTS are often associated with contaminated food products and always develop in an immunocompromised host.³ The clinical presentations of NTS infection include gastroenteritis, primary bacteremia, mycotic aneurysm, infective endocarditis, urinary tract infection, meningitis, empyema thoracis, and osteomyelitis.^{3–7} We performed a study to identify cases of unusual presentation of NTS infection related to subcutaneously implanted port reservoir and to further investigate their associated clinical and microbiological characteristics.

This study was conducted at 1 institution, a 900-bed hospital in southern Taiwan. From the computerized database of the bacteriology laboratory, we identified patients whose cultures

yielded NTS. The medical records of all patients with port-related infection caused by NTS included in this study were retrospectively reviewed.

The diagnosis of port-related NTS bacteremia was defined as a primary laboratory-confirmed NTS bacteremia in a patient with a port at the time of (or within 48 hours prior to) the onset of symptoms in whom the infection was not related to another site. Standard definitions for healthcare-associated bacteremia (HAIs) were used.⁸ Inappropriate use of antibiotics was defined as use of antimicrobial agents to which the clinical isolates were resistant *in vitro*.

During the study period, 4 patients were identified to have port-related NTS bacteremia: 3 infections were caused by group D *Salmonella*, and 1 was caused by group C *Salmonella*. All of the clinical isolates were susceptible to ampicillin, ceftazidime, ceftriaxone, ciprofloxacin, trimethoprim-sulfamethoxazole, and chloramphenicol. The clinical characteristics of 4 patients with port-related NTS bacteremia are summarized in Table 1. Of these 4 patients, 3 were men, and the age range of this cohort was 44–80 years. All of these patients had various cancers, and 1 patient had received chemotherapy prior to NTS infection. All of these patients had initial presentations of fever; however, none had signs or symptoms of enteritis. In addition, 1 patient had diabetes mellitus. Of these 4 patients, 3 had white blood cell counts >11,000/mm³, and none had neutropenia. In addition, 3 patients had hemoglobin <10 g/dl, and 2 patients had elevated C-reactive protein levels. None of these patients had their port removed. Although all 4 patients received appropriate antibiotics initially, 1 patient died due to NTS sepsis.

This study describes a rare cluster of NTS bacteremia in hospitalized cancer patients with ports at a single center. The immunocompromised conditions among these patients should be included as major risk factors for NTS bacteremia. Moreover, all of cases in this survey were classified as healthcare-associated, catheter-related bloodstream infections. Although rare, NTS should be considered as a possible pathogen causing intravascular catheter-related bacteremia in cancer patients in healthcare settings.

The clinical outcomes of patients with catheter-associated NTS bacteremia have not been well defined because of the

TABLE 1. Clinical Manifestations of 4 Patients with Nontyphoidal *Salmonella* Port-Related Infections

Case (year)	Age, y	Sex	Underlying disease	Healthcare-Associated Infection	Serogroup	Neutropenia	Removal of Catheter	Antibiotic	Mortality
1 (2008)	62	M	Lung cancer undergoing chemotherapy, hypertension	Yes	D	No	No	Ceftazidime	No
2 (2010)	53	M	Esophageal cancer, chronic hepatitis B	Yes	D	No	No	Ceftazidime	No
3 (2010)	44	M	Oral cancer	Yes	D	No	No	Ceftazidime	Yes
4 (2011)	80	F	Rectal cancer, ovarian cancer, diabetes mellitus, hypertension	Yes	C	No	No	Ciprofloxacin	No

limited number of cases. In the present work, 3 patients had favorable outcomes after appropriate antibiotics treatment without removal of the port. However, 1 patient died due to NTS sepsis, even under treatment with an appropriate antibiotic. Although a firm conclusion cannot be made based on our findings, further study is warranted. Until large-scale studies investigate the clinical impact of catheter removal on the prognosis of NTS-associated, catheter-related bacteremia, clinicians may follow the recommendations by the Infectious Diseases Society of America that all devices be removed in catheter-related infections caused by Gram-negative bacteria.⁹

The antibiotic susceptibility patterns of the clinical isolates in this study were susceptible to all tested antibiotics, including third-generation cephalosporins and fluoroquinolones. However, in recent studies, evidence of resistance to fluoroquinolones and third-generation cephalosporins is emerging, despite the overall resistance rate of <5%.¹⁰ Although third-generation cephalosporins or fluoroquinolones may be considered the appropriate antibiotic treatment of choice for patients with NTS bacteremia based on in vitro studies, clinicians still need to keep in mind the emergence of multidrug resistance among NST isolates.

In conclusion, port-related bacteremia caused by NTS can develop in immunocompromised patients, and NTS should be considered as a possible pathogen causing catheter-related bloodstream infections.

ACKNOWLEDGMENTS

Financial support: No financial support was provided relevant to this article.

Potential conflicts of interest: All authors report no conflicts of interest relevant to this article.

Hung-Jen Tang, MD,^{1,2}
Chien-Ming Chao, MD,^{3,4}
Chih-Cheng Lai, MD³

Affiliation: 1. Department of Medicine, Chi Mei Medical Center, Tainan, Taiwan; 2. Department of Health and Nutrition, Chia Nan University of Pharmacy and Science, Tainan, Taiwan; 3. Department of Intensive Care Medicine,

Chi Mei Medical Center, Liouying, Tainan, Taiwan; 4. Department of Nursing, Min-Hwei College of Health Care Management, Tainan, Taiwan.

Address correspondence to Chih-Cheng Lai, Department of Intensive Care Medicine, Chi-Mei Medical Center, Liouying, Tainan, Taiwan (dtmed141@gmail.com).

Infect Control Hosp Epidemiol 2015;36(4):492–493

© 2015 by The Society for Healthcare Epidemiology of America. All rights reserved. 0899-823X/2015/3604-0025. DOI: 10.1017/ice.2014.71

REFERENCES

1. Crump JA, Mintz ED. Global trends in typhoid and paratyphoid fever. *Clin Infect Dis* 2010;50:241–246.
2. Morpeth SC, Ramadhani HO, Crump JA. Invasive non-Typhi Salmonella disease in Africa. *Clin Infect Dis* 2009;49:606–611.
3. Hohmann EL. Nontyphoidal salmonellosis. *Clin Infect Dis* 2001;32:263–269.
4. Abuhasna S, Al Jundi A, Rahman MU, Said W. Non-typhoidal *Salmonella* group D bacteremia and urosepsis in a patient diagnosed with HIV Infection. *J Glob Infect Dis* 2012;4:218–219.
5. Ghais A, Armano R, Menten R, Mathot M, Zech F, Nassogne MC. Meningitis with subdural empyema due to non-typhoid *Salmonella* in a 9-month-old girl. *Eur J Pediatr* 2009;168:1537–1540.
6. Lai CC, Lee LN, Hsueh PR, Yu CJ, Yang PC. Empyema thoracic from *Salmonella choleraesuis*. *Emerg Infect Dis* 2005;11:1493–1494.
7. Schulze T, Lüdtkke A, Rahlff I, Tunn PU, Hohenberger P. *Salmonella* osteomyelitis in an immunocompromised patient presenting as a primary lymphoma of the bone. *Int J Infect Dis* 2009;13:e67–e70.
8. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection in the acute care setting. *Am J Infect Control* 2008;36:309–332.
9. Mermel LA, Allon M, Bouza E, Craven E, Flynn P, O'Grady NP, et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 updated by the Infectious Diseases Society of America. *Clin Infect Dis* 2009;49:1–45.
10. Lunguya O, Lejon V, Phoba MF, Bertrand S, Vanhoof R, Glupczynski Y, Verhaegen J, Muyembe-Tamfum JJ, Jacobs J. Antimicrobial resistance in invasive non-typhoid *Salmonella* from the Democratic Republic of the Congo: emergence of decreased fluoroquinolone susceptibility and extended-spectrum beta lactamases. *PLoS Negl Trop Dis* 2013;7:e2103.