Epidemiological investigation of a case of nosocomial Legionnaires’ disease in Taiwan: implications for routine environmental surveillance

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Abstract

An epidemiological investigation with Legionella and molecular subtyping was conducted to determine the source of a case of nosocomial Legionnaires’ disease (LD) who was hospitalized in three hospitals within a month. Legionella pneumophila serogroup 3, an uncommon serogroup for infection, was isolated from the patient’s sputum. Environmental surveillance revealed Legionella colonization in all three hospitals; the patient isolate matched the isolate from the first hospital by molecular typing. Culturing the hospital water supply for Legionella is a proactive strategy for detection of nosocomial LD even in hospitals experiencing no previous cases.

Keywords: Epidemiological investigation, hospital water supply, nosocomial legionellosis, PFGE, routine environmental cultures

Original Submission: 1 July 2008; Revised Submission: 14 November 2008; Accepted: 2 January 2009
Editor: S. Cutler
Article published online: 15 July 2009
Clin Microbiol Infect 2010; 16: 761–763
10.1111/j.1469-0691.2009.02890.x

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Nosocomial Legionnaires’ disease (LD) is rarely reported in Taiwan [1–4]. To our knowledge, Chen et al. [5] were the first to discover that the hospital water supply was responsible for cases of nosocomial LD in a Taiwan hospital. Because of this experience, several hospitals initiated routine environmental surveillance of the water supply, and found Legionella colonization in their hospital water supplies [6]. In this study, we report an epidemiological investigation of a case of nosocomial LD in which the patient was hospitalized in three hospitals within a month. None of the three hospitals had ever experienced a known case of nosocomial LD. The DNA subtyping technique was used to determine the source of the infection.

Three hospitals were involved in this study. Hospital A was an 1100-bed teaching hospital. Hospital B was a 260-bed community hospital with a long-term-care facility. Hospital C was a 700-bed military hospital. Hospital environmental cultures were conducted by taking swab samples of faucet outlets (both hot and cold water). The environmental samples were processed as previously described [7]. The media plates were incubated at 37°C for 5 days. Colonies that grew after subculture on buffered charcoal yeast extract medium but not on a blood agar plate were tested with a latex test (Oxoid Ltd, Basingstoke, UK) and confirmed using a monoclonal direct fluorescent antibody for serogroup identification (m-Technologies, Inc., Alpharetta, GA, USA). The patient’s sputum samples were processed as previously described [8]. The molecular subtyping of chromosomal DNA for pulsed-field gel electrophoresis (PFGE) was performed using a CHEF MAPPER system (Bio-Rad Laboratories, Richmond, CA, USA) [9], and criteria for interpretation of PFGE patterns were as previously published [10,11].

The patient was hospitalized at hospital A for 1 month, because of productive cough. The patient received no antimicrobial therapy and was later discharged without a definitive diagnosis. After staying home for 5 days, the patient was admitted to the long-term-care unit at hospital B. Four days later at hospital B, acute shortness of breath and fever ensued. The patient was transferred to the intensive-care unit at hospital C, where pneumonia was diagnosed on admission on the basis of chest radiography. Cefpirome was prescribed initially, but fever persisted for 3 days. On day 4 at hospital C, erythromycin, meropenem and ampicillin–sulbactam were administered. Given the negative test result for Legionella pneumophila serogroup 1 urinary antigen, LD was not considered initially. Thus, although the sputum specimen was taken on day 1 at hospital C, the sputum specimen was not processed for Legionella by the hospital microbiology laboratory.

The patient’s sputum was processed for LD on day 14 during an ongoing Legionella pneumonia study, in which sputum specimens from all pneumonia patients were processed weekly for Legionella. L. pneumophila serogroup 3 was isolated.
from the sputum culture on day 17. Moxifloxacin was immediately initiated on day 17 for 3 weeks, and the patient was discharged.

The water supply of the patient’s home was negative for Legionella (0/4). All three hospital water supplies were positive for L. pneumophila; 60% (6/10) of distal sites were positive for L. pneumophila serogroups 1, 3 and 6 in hospital A. One site (1/2) was positive for L. pneumophila serogroup 1 in the patient’s room in hospital B. Twenty-five per cent (5/25) of distal sites were positive for L. pneumophila serogroups 1 and 3 in hospital C. PFGE showed that the L. pneumophila serogroup 3 from hospital A matched the patient’s isolate (Fig. 1).

Physicians in Taiwan tend to overlook nosocomial LD, as it is rarely reported. In this study, the patient’s sputum was tested for Legionella at hospital C because: (i) the hospital’s environmental surveillance revealed that 27% of distal sites of hospital water supply were positive for Legionella [6]; and (ii) the hospital had an ongoing prospective study in which every patient with nosocomial pneumonia was screened for Legionella. Coincidently, water supplies in all three hospitals were positive for Legionella, and were thus potential sources of infection. Molecular subtyping established that hospital A was probably the source.

Our finding confirmed the hypothesis that cases of nosocomial LD can be found through pro-active culturing of the hospital water distribution system. In four studies conducted in the USA and Canada, all hospitals colonized with Legionella reported nosocomial LD following subsequent clinical surveillance [12–16]. In a Spanish study of 12 hospitals, 92% of hospitals (11/12) found cases of nosocomial LD following prospective clinical surveillance [17]. Culturing of the hospital water supply for Legionella as a pro-active measure for prevention of nosocomial LD has been adopted in France, Denmark, Germany, The Netherlands, Spain, Italy, Norway, Portugal, and Switzerland [18].

Our experience with L. pneumophila serogroup 3 has relevance for a recent report. Leoni et al. [19] found no cases of nosocomial LD, despite the fact that 60% of the hospital water samples were positive for L. pneumophila. The investigators used Legionella urinary antigen as a screening test, and found no cases, and concluded that monitoring of hospital water is ‘of little clinical significance’. However, we note that their water was colonized with L. pneumophila serogroup 3, which cannot be detected by urinary antigen test [20]. Had these investigators used culture, cases of LD might have been found as in our report.

In summary, environmental monitoring followed by clinical surveillance revealed a case of nosocomial LD due to a serogroup of L. pneumophila that is not commonly associated with infection. The infection had been acquired from hospital A, which had no previous knowledge or experience with LD. Advocates of a pro-active approach for prevention by using environmental cultures recommend that respiratory tract culture for Legionella should be adopted if the hospital water supply is colonized with L. pneumophila other than serogroup 1.

Acknowledgements

We thank V. L. Yu for his critique of this manuscript. The findings in this manuscript were previously presented at the 23rd meeting of the European Working Group for Legionella Infections in Madrid, 11–13 May 2008.

Transparency Declaration

All authors report no conflicts of interest.

References

First isolation of *Legionella* species, including *L. pneumophila* serogroup 1, in Greek potting soils: possible importance for public health

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Abstract

A total of 21 *Legionella* isolates were recovered from six out of 22 samples of potting soil from the Athens area, Greece. *Legionella pneumophila* (serogroups 1 and 2–15) and species and serotypes included in the group of *L. longbeachae* serogroups 1 and 2, *L. bozemanii* serogroups 1 and 2, *L. dumoffii*, *L. gormanii*, *L. jordanis*, *L. micdadei* and *L. anisa* were isolated on BCYEa agar containing cysteine, GVPC and natamycin and on BCYEa agar containing cysteine, Wadowsky Yee supplement and natamycin. The bacterial load was 4000–120 000 CFU/g of potting soil. The isolation of *L. pneumophila* serogroup 1 from Greek potting soils is reported here for the first time.

Keywords: Environmental exposure, *Legionella pneumophila* serogroup 1, Legionnaires’ disease, public health, soil

Original Submission: 18 March 2009; Revised Submission: 28 May 2009; Accepted: 3 June 2009

Editor: D. Raoult

Article published online: 11 September 2009

Clin Microbiol Infect 2010; 16: 763–766
10.1111/j.1469-0691.2009.02957.x

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