

mg/dL to 2.1 ± 0.2 mg/dL at week 3 and 2.4 ± 0.2 mg/dL at week 6, although 24-hr urine magnesium excretion decreased by approximately 25% from weeks 3 to 6. There was no significant change in serum creatinine, blood urea nitrogen, or creatinine clearance with magnesium supplementation, and no reduction in antihypertensive drug requirements or in systolic or diastolic blood pressure was seen. Complications of magnesium therapy in 13 patients included loose stools, greater than 3 per day, or frank diarrhea (5). Thus, clinical magnesium supplementation has no obvious beneficial effect on renal parameters, although

no histologic data are available. On the other hand, the practicality of chronic magnesium supplementation is questionable, because gastrointestinal side effects during magnesium therapy seem frequent.

LEENDERT C. PAUL
*Department of Nephrology
Leiden University Medical Center
The Netherlands*

REFERENCES

1. Pere A-K, Krogerus L, Mervaala EMA, et al. Detrimental effect of dietary sodium and beneficial effect of dietary magnesium on glomerular changes in cyclosporine-A-treated spontaneously hypertensive rats. *Nephrol Dial Transplant* 1998;13:904.
2. Pere A-K, Krogerus L, Mervaala EMA, et al. Beneficial effects of dietary magnesium and potassium on cardiac and renal morphologic features in cyclosporin A-induced damage in spontaneously hypertensive rats. *Surgery* 2000;128:67.
3. Burdman EA, Andoh TF, Lindsley J, et al. Effects of oral magnesium supplementation on acute experimental cyclosporin nephrotoxicity. *Nephrol Dial Transplant* 1994;9:16.
4. Miura K, Najatani T, Asai T, et al. Role of hypomagnesemia in chronic cyclosporine nephropathy. *Transplantation* 2002;73:340.
5. Nguyen T, Steiner RW. A trial of oral magnesium supplementation in renal transplant recipients receiving cyclosporine. *Transplant Proc* 1998;30:4317.

Legionnaires' Disease in a Renal Transplant Recipient: Nosocomial or Home-Grown? *Transplantation* 2002; 74: 890.

A. Sax, S. Dharan, D. Pittet

LEGIONNAIRES' DISEASE IN A TRANSPLANT RECIPIENT ACQUIRED FROM THE PATIENT'S HOME: IMPLICATIONS FOR MANAGEMENT

In this issue of *Transplantation*, Sax et al. (1) present an instructive case of Legionnaires' disease in a renal transplant recipient. The patient had been in the hospital for 16 days when he presented with hospital-acquired pneumonia. Microbiologic studies were unrevealing for standard bacterial pathogens, but direct fluorescent antibody on bronchoalveolar lavage fluid was positive for *Legionella pneumophila* serogroup 1. The diagnosis was further confirmed by a positive urinary antigen assay. Because the incubation period for Legionnaires' disease is thought to be from 2 to 10 days, this case was understandably considered as acquired from the hospital. An extensive epidemiologic and environmental investigation failed to reveal *L. pneumophila* in any water specimens taken from the hospital. However, the patient had gone home on day 13 and returned shortly thereafter. Environmental cultures of his home revealed *L. pneumophila* taken from the potable water supply. Molecular subtyping by

pulsed-field electrophoresis and fragment length polymorphism showed that the patient isolate and the isolate obtained from his home were identical.

The authors emphasize that the patient had taken a shower and so presumably that was the source of the organism. However, it is not well known that aspiration is the most common mode of transmission in hospital-acquired Legionnaires' disease, not aerosolization (2). We, in collaboration with the Centers for Disease Control and other investigators, first reported an association with showering in 1981, but subsequent case control studies at our institutions failed to confirm this association (3). Numerous prospective studies have subsequently shown that showering is not a risk factor, and in two prospective studies, a history of showering proved to be a protective factor (4-7)! The reason for this apparent paradox is that the patients who are ambulatory are more likely to take showers and are less likely to be in circumstances leading to aspiration.

The attack rate for hospital-acquired Legionnaires' disease is especially high in transplant recipients (8, 9). The reason is that the risk factors for aspiration occur in transplant recipients, including intubation, immunosuppression including corticosteroids, and often times chronic lung disease associated with cigarette smoking. Heart transplant recipients are at highest risk (10), whereas bone marrow

transplant recipients have the lowest risk. Most cases of Legionnaire's disease in surgical patients occur in the early postoperative period consistent with aspiration as the mode of transmission (11-13). Given the fact that the drinking water in many hospitals is colonized with *Legionella*, endotracheal intubation and surgery involving general anesthesia could lead to aspiration from colonization of the oropharynx or from aspirating contaminated water. Contaminated water might also be delivered into the lung via rinsing of respiratory tract equipment or aerosolization via respiratory tract devices (14, 15). Saravolatz et al. (16) have shown that 3% of renal transplant recipients had positive DFA stains for *Legionella* from their oropharyngeal secretions, suggesting the possibility of colonization, although demonstration of oropharyngeal *Legionella* colonization using cultures has been difficult (17).

Routine environmental cultures of the hospital water supply for *Legionella* are mandated for hospitals in Pittsburgh, Maryland, Spain, Denmark, and France (18). The CDC has recommended the use of environmental cultures in hospitals performing bone marrow transplants (19). It is unclear why the same recommendation was not extended to solid organ transplants.

Legionella species have been isolated from homes in numerous surveys (20-22) and linked to commu-

¹VA Medical Center and The University of Pittsburgh, Pittsburgh, PA.

²Address correspondence to: Victor L. Yu, M.D., VA Medical Center, Infectious Disease Section, University Drive C, Pittsburgh, PA. E-mail: vly+@pitt.edu.

nity-acquired Legionnaires' disease (23, 24). The authors suggest that the home water supplies of transplant recipients be routinely cultured, as is currently the policy for many hospitals. Effective disinfection methods exist for homes. Modular ultraviolet light and thermal eradication (superheat and flush) have been used successfully in homes, although long-term evaluation has not been conducted (25, 26). However, we have not advocated routine culturing for *Legionella* in the home because water sources are ubiquitous and patients can visit many other buildings and be exposed to contaminated water.

We now recommend that all immunosuppressed patients boil and store water to be used for drinking, as is currently done in many developing nations. This recommendation is not as radical as it seems. In many U.S. cities, patients with human immunodeficiency virus and other immunosuppressed patients are advised to boil their water as a precaution against waterborne pathogens. Infections caused by *Cryptosporidium*, *Giardia lamblia*, *Pseudomonas aeruginosa*, *Stenotrophomonas maltophilia*, *Fusarium*, and even *Aspergillus fumigatus* have been transmitted from drinking water to immunosuppressed patients (27–30),

NINA SINGH¹
 JANET E. STOUT¹
 VICTOR L. YU^{1,2}

REFERENCES

- Sax A, Dharan S, Pittet D. Legionnaires' disease in a renal transplant recipient: Nosocomial or home grown? *Transplantation* 2002; 74: xxx.
- Yu VL. Could aspiration be the major mode of transmission for Legionella? *Am J Med* 1993; 95: 13–15.
- Cordes LG, Wiesenthal AM, Gorman GW, et al. Isolation of Legionella pneumophila from hospital showerheads. *Ann Intern Med* 1981; 94: 195–197.
- Shands K, Ho J, Meyer R, Gorman G, et al. Potable water as a source of Legionnaires' disease. *JAMA* 1985; 253: 1412–1416.
- Blatt SP, Parkinson MD, Pace E, et al. Nosocomial Legionnaires' disease: Aspiration as a primary mode of transmission. *Am J Med* 1993; 95: 16–22.
- Helms CM, Massanari R, Zeiter Setal. Legionnaires' disease associated with a hospital water system: A cluster of 24 nosocomial cases. *Ann Intern Med* 1983; 99: 172–178.
- Kool JL, Fiore AE, Kioski CM, et al. More than ten years of unrecognized nosocomial transmission of Legionnaires' disease among transplant patients. *Infect Control Hosp Epidemiol* 1998; 19: 898–904.
- Mathys W, Deng MD, Meyer J, Junge-Mathys E. Fatal nosocomial Legionnaires' disease after heart transplantation: Clinical course, epidemiology, and prevention strategies for the highly immunocompromised host. *J Hosp Infect* 1999; 43: 242–246.
- Chow J, Yu VL. Legionella: A major opportunistic pathogen in transplant recipients. *Semin Respir Infect* 1998; 13: 132–139.
- Redd SC, Schuster DM, Quan J, Pilkaytis BD, Spika JS, Cohen ML. Legionellosis cardiac transplant recipients: Results of a nationwide survey. *J Infect Dis* 1988; 158: 651–653.
- Tompkins LS, Roessler BJ, Redd SC, et al. Legionella prosthetic-valve endocarditis. *N Engl J Med* 1988; 318: 530–535.
- Yu VL, Kroboth FJ, Shonnard J, Brown A, McDearman S, Magnussen MH. Legionnaires' disease: New clinical perspective from a prospective pneumonia study. *Am J Med* 1982; 73: 357–361.
- Johnson JT, Yu VL, Best M, et al. Nosocomial legionellosis uncovered in surgical patients with head and neck cancer: Implications for epidemiologic reservoir and mode of transmission. *Lancet* 1985; 2: 298–300.
- Arnou P, Chou T, Weil D, Shapiro E, et al. Nosocomial Legionnaires' disease caused by aerosolized tap water from respiratory devices. *J Infect Dis* 1982; 146: 460–467.
- Woo AH, Goetz A, Yu VL. Transmission of Legionella by respiratory equipment and aerosol generating devices. *Chest* 1992; 102: 1586–1590.
- Saravolatz L, Pohlod D, Helzer K, Wentworth B, Leviin N. Legionella infections in renal transplant recipients. In: Thornsberry C, Balows A, Feeley JC, Jakubowski W, eds. *Proceedings of the 2nd International Symposium*. Washington, DC, American Society for Microbiology, 1984, pp 231–233.
- Pedro-Botet ML, Sabria M, Sopena N, Garcia-Nunez M, Morera J, Reynaga E. Environmental legionellosis and oropharyngeal colonization by legionella in immunosuppressed patients. *Infect Control Hosp Epidemiol* 2002; 23: 279–281.
- Yu VL. Nosocomial legionellosis. *Curr Opin Infect Dis* 2000; 13: 385–388.
- Centers for Disease Control and Prevention. CDC/IDSA/ASBMT Guidelines for the prevention of opportunistic infections in hematopoietic stem cell transplant recipients. *MMWR Morb Mort Wkly Rep* 2000; 49: 1–147.
- Arnou PM, Weil D, Para MF. Prevalence and significance of Legionella pneumophila contamination of residential hot-tap water systems. *J Infect Dis* 1985; 152: 145–151.
- Stout JE, Yu VL, Yee YC, Vaccarello S, Diven W, Lee TC. Legionella pneumophila in residential water supplies: Environmental surveillance with clinical assessment for Legionnaires' disease. *Epidemiol Infect* 1992; 190: 49–57.
- Lee TC, Stout JE, Yu VL. Factors predisposing to *L. pneumophila* colonization in residential water systems. *Appl Environ Health* 1988; 43: 59–62.
- Stout JE, Yu VL, Muraca P, Joly J, Troup N, Tompkins LS. Potable water as the cause of sporadic cases of community-acquired Legionnaires' disease. *N Engl J Med* 1992; 326: 151–154.
- Strauss WL, Plouffe JF, File TM Jr, Lipman HB, Salstrom SJBFRF, Breiman RF. Risk factors for domestic acquisition of Legionnaires' disease. *Arch Intern Med* 1996; 156: 1685–1692.
- Yu VL, Stout JE. Sporadic cases of Legionnaires' disease. *N Engl J Med* 1992; 25: 1700–1701.
- Stout JE, Yu VL, Muraca P. Legionnaires' disease acquired within the homes of two patients: Link to the home water supply. *JAMA* 1987; 257: 1215–1217.
- Squier C, Yu VL, Stout JE. Waterborne nosocomial infections. *Curr Infect Dis Rep* 2000; 2: 490–496.
- Anaissie EJ, Stratton SL, Dignani MC, Summerbell RC, Rex JH, Monson TP. Pathogenic *Aspergillus* species recovered from a hospital water system: A 3 year prospective study. *Clin Infect Dis* 2002; 34: 780–789.
- Anaissie EJ, Kuchar RT, Tex JH, et al. *Fusarium* species colonization of a hospital water system: A new paradigm for the epidemiology of opportunistic mold infections. *Clin Infect Dis* 2001; 33: 1871–1878.
- von Reyn CF, Barber TW, et al. Persistent colonisation of potable water as a source of *Mycobacterium avium* infection in AIDS. *Lancet* 1994; 343: 1137–1141.