

Public Health

Coping with *Legionella*

Epidemiology

The *Legionella* species of gram-negative aerobic bacilli are widely distributed in aquatic habitats and soil. Since the discovery of *Legionella pneumophila* in 1976 following an outbreak of pneumonia among delegates attending an American Legion convention in Philadelphia, the family Legionellaceae has expanded to include 42 described species, 18 of which have been documented to cause human infection.¹

Legionella pneumophila causes about 85% of reported cases of infection; *L. micdadei*, *L. bozemanii* and *L. dumoffii* are also relatively common.

Originally thought to be exotic pathogens, *Legionella* spp. are now recognized to be a common cause of community-acquired and nosocomial pneumonia. As many as 15% of North American patients hospitalized because of community-acquired pneumonia may be victims of *Legionella* spp. infections,² although a surveillance study indicates that only about 3% of cases are correctly diagnosed.³ Most of these community-acquired cases are sporadic. Smoking, chronic lung disease, advanced age and immunosuppression increase susceptibility.²

The epidemiology of nosocomial legionellosis has shifted. In the 1980s most reported outbreaks occurred at tertiary-care centres. More recently, sporadic nosocomial cases from community hospitals have predominated.²

The disease can be acquired by inhaling aerosols or by microaspiration of water contaminated with *Legionella* spp. The bacteria are chlorine tolerant⁴ and survive the water-treatment process. Colonization depends on water temperature, sediment accumulation and commensal flora.¹ Surveillance studies have identified *Legionella* spp. in water-distribution systems in 83%–92% of health care facilities,^{5,6} raising fears that it may be ubiquitous in hospital plumbing systems.

Clinical management

Legionella spp. infection manifests in 2 very different forms: Pontiac fever and pneumonia (Legionnaires' disease). Pontiac fever is an acute, self-limited, flu-like illness without pneumonia, whereas pneumonia is the predominant clinical syndrome of Legionnaires' disease. After an incubation period of about 10 days the illness begins with a 1-day prodrome of myalgias, malaise and a slight headache. This is followed by an acute onset of fever, usually above 40°C, a slightly productive cough and, often, pleuritic pain. Encephalopathic features may be present as well as gastrointestinal symptoms; diarrhea occurs in 20%–40% of cases.¹ Chest x-rays show nonspecific patchy infiltrates that may progress to nodular infiltrates in 1 or more lobes. Effusions are infrequent. Sputum culture has a sensitivity of about 80%.² Because special media are necessary for growth, the laboratory test must be specifically requested. Less sensitive but more rapid diagnostic tests include the direct fluorescent antibody stain and the urinary antigen test.^{1,2} Laboratory and clinical data suggest that fluoroquinolone and newer macrolide–azalide agents against *L. pneumophila* are superior to erythromycin.⁷

Prevention

There are 3 effective ways to disinfect water-distribution systems.¹ Copper–silver ionization units use electrodes to generate metallic ions which disrupt bacterial cell walls and lead to cell lysis and death. These units are highly effective and provide residual protection throughout the system.^{1,8} As well, temperatures above 60°C are bactericidal for *L. pneumophila*. The “superheat-and-flush” technique allows for urgent disinfection. With this method water temperature is raised to 60°C–77°C for several days, and then each distal water site is flushed for at least 30 minutes.

The temperature is then maintained at 66°C; this carries the risk of scalding patients, however.¹ Ultraviolet light kills *Legionella* spp. by damaging cellular DNA, but it must be combined with 1 of the other methods as well. Hyperchlorination is no longer recommended because *Legionella* spp. are relatively tolerant to chlorine.^{1,4}

Routine monitoring for *Legionella* spp. in hospital water is recommended.^{2,6} A minimum of 10 distal sites (faucets and showerheads) should be sampled, as should all hot water tanks. Disinfection should be considered on the basis of the number of positive culture sites and any prior experience with hospital-acquired cases.² Recommendations for home water systems are less clear.⁹ Legionellosis is a reportable disease. — *Erica Weir, CMAJ*

References

1. Yu V. *Legionella pneumophila*. In: Mandell G, Douglas RG, Bennett JE, Dolin R, editors. *Mandell, Douglas, and Bennett's principles and practice of infectious diseases*. 5th ed. Philadelphia: Churchill Livingstone; 2000.
2. Stout J, Yu V. Legionellosis. *N Engl J Med* 1997; 337:682-7.
3. Marston BJ, Plouffe JF, File TM, Hackman BA, Salstrom SJ, Lipman HB, et al. Incidence of community-acquired pneumonia requiring hospitalization. Results of a population-based active surveillance study in Ohio. *Arch Intern Med* 1997;157: 1709-18.
4. Kutcha JM, States SJ, McNamara AM. Susceptibility of *Legionella pneumophila* to chlorine in tap water. *Appl Environ Microbiol* 1983;46:1134-9.
5. Kool JL, Bergmine-Sweat D, Butler JC, Brown EW, Peabody DJ, Massi DS, et al. Hospital characteristics associated with colonization of water systems by *Legionella* and risk of nosocomial legionnaires' disease: a cohort study of 15 hospitals. *Infect Control Hosp Epidemiol* 1999;20: 798-805.
6. Goetz AM, Stout JE, Jacobs SL, Fisher MA, Ponsler RE, Dunning S, et al. Nosocomial legionnaires' disease discovered in community hospitals following cultures of the water system: seek and ye shall find. *Am J Infect Control* 1998; 26:8-11.
7. Edelstein PH. Antimicrobial chemotherapy for legionnaires' disease: a review. *Clin Infect Dis* 1995;21(3 Suppl):S265-76.
8. Stout JE, Lin YS, Goetz AM, Muder RR. Controlling *Legionella* in hospital water systems: experience with the superheat-and-flush method and copper–silver ionization. *Infect Control Hosp Epidemiol* 1998;19:911-4.
9. Chin J, editor. *Control of communicable diseases manual: an official report of the American Public Health Association*. 17th ed. Washington: American Public Health Association; 2000.