Legionellosis: epidemiology, management and prevention

AUTHOR  Kathryn Little, BSc, PGDip, PGCEDipN (Infection Control), RGN, is senior clinical editor, Nursing Times’ Infection Control supplement.


Legionellosis or legionnaires’ disease has attracted media attention again with a new outbreak in Hereford (see p7). Legionellosis is an acute bacterial pneumonia most frequently caused by the Gram-negative bacillus, Legionella pneumophila, although other species of legionella have been attributed as causal agents of the disease (Burton and Engelkirk, 1996).

The illness has several characteristic features including headache, fever, a dry cough followed by a productive cough, chills, shortness of breath, diarrhoea and pleural and abdominal pain. Infection is associated with a mortality rate of approximately 10–15 per cent in healthy individuals (HPA, 2003), although an outbreak centred in Barrow-in-Furness in Cumbria had a mortality rate of only 3.5 per cent (PHLS, 2002).

In this outbreak, where 500 people presented with symptoms including fever, diarrhoea, and kidney and liver dysfunction, some 172 cases of legionellosis were identified and six people died. The source was found to be an air conditioning cooling system in an alley.

The organism is associated with environmental water sources, including air conditioning systems, cooling towers, showerheads, jacuzzis, humidifiers and tap water. Infection results from inhalation of aerosols containing the organism. There is no evidence of person-to-person spread. The incubation period for the illness is 2–10 days.

Epidemiology

The bacterium was first identified in the USA following an outbreak of pneumonia among delegates at a legionnaires’ convention in a hotel in Philadelphia (Joseph et al, 1997). There is some indication that outbreaks may have occurred before this incident and been responsible for several deaths (Burton and Engelkirk, 1996). Outbreaks have since occurred in hotels, cruise ships and hospitals and have often been traced to the air conditioning in these buildings (Joseph et al, 1997). The disease affects more men than women (3:1). Older people, people who smoke heavily and people who have cancer, alcohol problems or pre-existing respiratory conditions, such as asthma, are more vulnerable to the disease and mortality rates can be higher in these cases. In hospital outbreaks the risk factor is greatly increased for patients undergoing surgical procedures (Stout and Yu, 1997).

Legionnaires’ disease is not a notifiable disease in England and Wales. Voluntary notification to the Communicable Disease Surveillance Centre (CDSC) occurs, but under-reporting may result in a false picture of the true extent of incidence.

Diagnosis

To meet agreed case definitions for legionnaires’ disease, a patient must have clinical or radiological evidence of pneumonia and laboratory evidence of legionella infection (Joseph et al, 1997). The organism Legionella pneumophila may be identified in sputum, tissue, blood and urine specimens. Samples should be sent to the laboratory for culture and antibiotic sensitivity tests. Chest X-rays will show consolidation in affected parts of the lungs.

BOX 1. PREVENTIVE MEASURES

- Perform regular risk assessment wherever water is stored.
- Identify systems in use and potential for aerosol generation. Premises should be registered.
- Monitor water temperature.
- Identify adequate means of preventing or controlling the bacteria, regularly check systems and document the results.
- Assess the risk and rectify. This should be done for normal situations and those where equipment breaks down.
- Remove plumbing ‘dead legs’ and unused pipes where there is a risk of water collecting and biofilm developing, causing Legionella pneumophila growth.
- Do not have hot and cold pipes together, as they may increase the temperature of the cold water and encourage growth of...
Treatment
Antibiotics provide effective treatment in many cases. Erythromycin, clarithromycin and azithromycin are generally the most successful in fighting the disease. In addition, symptoms such as fever or diarrhoea can be treated conventionally as they arise.

Surveillance and infection control
Surveillance of the disease is an integral part of the infection control process. Reporting the disease initially to the consultant in communicable disease control (CCDC) and notifying the Health Protection Agency (HPA) and CDSC allows these bodies to gather evidence about the true incidence of the disease and to make recommendations on its control.

Identifying the causative organism and isolating the source of the infection ensures appropriate control measures can be put in place. Recognition of the problem is identified by an increase in the number of expected cases. Collection and analysis of specimens/data will support the start of appropriate treatment and implementation of other infection control measures.

This could result in the closure of premises or the withdrawal of equipment from use to enable decontamination to take place and prevent further infections from occurring. It is important that relevant information is fed back to clinical staff in order that they can maintain an up-to-date awareness of the disease, which they can apply to their clinical practice.

The water supply
As water supplies are frequently the source of Legionella pneumophila, it is important to implement correct cleaning and maintenance procedures in order to prevent multiplication of the organism and further outbreaks of infection. This can be achieved by chlorination of water systems. An approved code of practice for the control of Legionella pneumophila states that cleaning and disinfection of water systems is necessary (HSE, 2003).

Legionella pneumophila is able to reproduce at temperatures between 20°C and 60°C. This means that the temperature of the hot water supply in public buildings must not fall below 60°C. Steps should be taken to ensure staff and patients are protected from scalds, which might result from contact with a water supply of this temperature or above.

Warning signs should alert users to this risk at each sink, particularly where mixer taps are not present. If the water supply system is properly maintained showerheads do not require disinfecting, however, risk may be reduced by running the shower daily or weekly to ensure that the reservoir of water left in the head is dissipated.

Respiratory equipment
Woo et al (1992) suggest that respiratory therapy equipment may be a potential risk if it is contaminated with tap water. However, they draw attention to the quality of evidence from which this inference is drawn. They make recommendations for enhancing the quality of data collected during outbreaks of legionellosis where respiratory equipment is suspected of being involved in transmission of the organism.

Re-breathe bags that are attached to ventilators may act as a source for Legionella pneumophila if they are rinsed with tap water (Wilson, 2001). Mastro et al (1991) draw attention to the risk that nebulisers pose as a result of having tap water in them for long periods of time between use, which could lead to direct inhalation of the organism by vulnerable patients.

Despite the lack of evidence to conclusively link equipment in the transmission of Legionella pneumophila the reasons for adopting and maintaining high standards of practice in relation to safe decontamination are well documented.

Nursing considerations
Isolation of patients in hospital is not necessary as there is no evidence to indicate that person-to-person transmission of the organism takes place.

Outbreaks of legionnaires’ disease continue to occur and have the most significant effects on older people and other vulnerable groups. Media attention is often focused on factors leading to the emergence of the disease and there is evidence that equipment, such as air conditioning systems, need to be adequately maintained to reduce risk.

Mortality rates vary but have been suggested to be as high as 10–15 per cent. This highlights the need to adequately maintain air conditioning and water supply systems and illustrates the diversity of skills required to manage infection risks.

Policies in hospital and other health care settings must reflect safe practice for the decontamination of equipment and health care should be delivered using risk assessment and universal precautions.

References


This article has been double-blind peer-reviewed.

For related articles on this subject and links to relevant websites see www.nursingtimes.net

Box 2. Approved Code of Practice for the Cleaning and Disinfecting of Water Systems

Chlorination
Stored water should contain 20–50mg/l of free residual chlorine. This should be allowed to flow through the system until the smell is obvious at all outlets. The flow should then be halted and the chlorinated water allowed to stand in the system for up to two hours.

Thermal Disinfection
The aim is to increase the temperature of the water to greater than 60°C (a level at which the organism cannot survive) for five minutes.

Clinical Practice
Should be based on risk assessment and the application of universal precautions.

Keywords
Public health, Legionnaires’ disease, Legionellosis