Part 1

Legionnaires' Disease and Travel

The prime aim of the European Surveillance Scheme for Travel Associated Legionnaires' Disease is to provide a capability within the European Union countries for the detection, prevention and control of cases and outbreaks of legionnaires' disease. Through shared information and member state shared actions, residents of European countries are increasingly protected from acquiring legionella infection linked to travel, either within their own country or abroad.

1. Background to the guidelines

In recent years, the European Union (EU) has experienced several large outbreaks of legionnaires' disease (6-8). In July 2001 the world's largest community outbreak of legionnaires' disease occurred in Spain (9). In addition, an annual rise in the number of cases, clusters and linked cases associated with a visit to a hotel or other tourist accommodation has been identified by the surveillance scheme (10). Some of these clusters have involved a considerable number of cases. Lack of European guidance or consensus about control measures have created many difficulties for patients, other clients, hoteliers, tour operators and public health authorities in the countries concerned. The European guidelines have been written to address these difficulties and to inform all those that need to know of the new procedures adopted by the EWGLI surveillance scheme.

The European surveillance scheme operates as a disease specific network according to Decisions 2119/98/EC (2) and 2000/96/EC (3) for the setting up of a network for the epidemiological surveillance and control of communicable diseases in the Community. Article 3(F) of Decision 2119/EC98/EC and Article 4 of Decision 2000/96/EC are particularly pertinent for these guidelines and this disease specific network. In August 2000, five members of the surveillance scheme and EWGLI were funded by the European Commission (DG Health and Consumer Protection) to work together for one week and prepare a first draft guidelines document for discussion and comments. Extensive consultations then took place with members of the surveillance scheme and EWGLI, other professional groups and the European Commission Network Committee. The sixth and final draft of the guidelines was agreed in May 2002; their implementation commenced on 1 July 2002 and full endorsement by the Network Committee took place in June 2003. Part 2 of the document was updated in January 2005. Countries using the guidelines do so because they support and agree their contents.

2. Introduction

Legionnaires' disease was first identified in 1976 (4). International collaborations at the European level began in 1986 when the European Working Group for Legionella Infections (EWGLI) was first formed and surveillance of travel associated infections was implemented the year after. Protecting citizens against travel associated legionnaires' disease frequently involves international activities. Therefore it is important that participating countries share the common objective of minimising risk of infection from recognised environmental sources for all their citizens. These European guidelines aim to provide a set of common procedures that should be followed by all European countries involved in protecting their citizens against legionnaires' disease. They have been produced at this time in response to revised procedures for reporting and responding to cases of travel associated legionnaires' disease within European member states and to reflect changes in the surveillance scheme's formal status within the European Union. They also offer technical advice to professional groups involved with the control and prevention of legionella in water systems.

Cases associated with travel are known to comprise up to 50% of national reports of the disease in some countries (11). Because of widespread media publicity, the public at large is increasingly aware of legionnaires' disease and the risks associated with tourist accommodation. It demands appropriate action from national governments and public health officials to provide them with adequate protection against these risks. Control measures taken in response to cluster detection have frequently included the rapid withdrawal of guests from the accommodation site, thus preventing further cases, and international follow up investigations designed to estimate the full extent of infection in people exposed to the source of infection.

3. Legionella – natural history of the organism

Legionella bacteria are common and can be found naturally in environmental water sources such as rivers, lakes and reservoirs, usually in low numbers. From the natural source, the organism passes into sites that constitute an artificial reservoir (channelled water in towns, water systems in individual buildings, etc). Water temperatures in the range of 20°C to 45°C favour growth of the organism. The organisms do not appear to multiply below 20°C and will not survive above 60°C. They may, however remain dormant in cool water and multiply when water temperatures reach a suitable level. Legionella bacteria also require nutrients to multiply, and sources include commonly encountered organisms within the water system itself such as algae, amoebae and other bacteria. The presence of sediment, sludge, scale, rust and other material within the system, together with biofilms, are also thought to play an important role in harbouring and providing favourable conditions in which the legionella bacteria may grow.

Further details on sources of legionella infection can be found in Part 3 paragraph 26.

4. What is legionnaires' disease?

Legionnaires' disease is a serious form of pneumonia that carries with it a mortality rate in the order of 10-15% in otherwise healthy individuals. Symptoms include a flu-like illness, followed by a dry cough and frequently progress to pneumonia. Approximately 30% of people infected may also present with diarrhoea and vomiting and around 50% may show signs of mental confusion. The incubation period normally ranges from 2-10 days with 3-6 days the typical illness onset time after exposure.

Legionnaires' disease may present as an outbreak of two or more cases following a limited temporal and spatial exposure to a single source, as a series of independent cases in an area in which it is highly endemic or as sporadic cases without any obvious temporal or geographical grouping. Outbreaks have occurred repeatedly in buildings such as hotels and hospitals.

5. Methods of transmission

Legionnaires' disease is normally acquired through the respiratory system by breathing in air that contains legionella bacteria in an aerosol. An aerosol is formed from tiny droplets that can be generated by spraying the water or by bubbling air into it, or by it impacting on solid surfaces. The smaller the droplets, the more dangerous they are. Droplets with a diameter of less than 5µ reach the lower airways more easily. Case to case transmission between humans has never been demonstrated.

6. Recognised potential sources of travel associated infection

The following are all potential sources of travel associated legionnaires' disease:

- Hot and cold water systems
- Cooling towers and evaporative condensers
- Spa pools/natural pools/thermal springs
- Fountains/sprinklers
- Humidifiers for food display cabinets
- Respiratory therapy equipment

7. Risk factors associated with infection

Recognised risk factors for legionnaires' disease include being of an older age group (>50 years), male, having a chronic underlying disease with or without an associated immunodeficiency and being a heavy cigarette smoker. The public health risks associated with legionnaires' disease and travel are mainly related to the special nature of providing temporary accommodation for people in circumstances that may differ from their normal way of life. Older people are more susceptible to legionella infection and during their travels may be subject to changes in life style and a build up of exposure to legionella from infected

sources such as air conditioning or contaminated water systems, against which they have less resistance than younger adults. Diagnosis and treatment of some of these people may be compounded by delay in their not seeking medical assistance until they arrive back in their own country.

Although 42 different species of *Legionella* have been described, not all have been associated with human disease (12). *L. pneumophila* is the species most often detected in diagnosed cases.

8. Risks factors associated with accommodation for travellers

Infection linked to travel is associated with particular features of living in accommodation designed for short stays and frequently with in-built seasonal variation in use by people. The occupancy of some accommodation sites and therefore use of the water facilities, may be intermittent, and demands of water use for bathing may surge at particular times of the day and night. The accommodation may be sited in areas of low rainfall that may result in an intermittent water supply of varying quality. Water treatment regimes will need more intensive monitoring and more frequent adjustment than would be normal for a water supply of consistent quality. It is possible that, during periods of water shortage, non-essential facilities such as spa pools may have to be taken out of use because it is not possible to replace the water frequently enough to ensure their safe operation. During the low season, room occupancy may be low, sections of the hotel closed or even the whole hotel closed. These factors can cause the whole or parts of the water system to have low levels of flow and become stagnant, with resulting loss of temperature or residual treatment biocide. The temperature control of hot and cold water may fluctuate because of outside ambient temperatures. Hotels or other accommodation sites frequently have many rooms with individual water outlets, inevitably resulting in very complex water systems, often with long lengths of water piping.

Hotel extensions may be built and connected to the original hot water system, resulting in the heating capacity no longer being sufficient to maintain the circulating temperature throughout the whole premises. Hotel gardens are frequently irrigated with sprinklers and these may present an additional risk, particularly if they utilise recycled grey-water or sewage based water.

The seasonal nature of the holiday trade means that staff may frequently change, making it difficult to maintain a core of adequately trained personnel. In addition hotel engineers often have no training in controlling legionella in hotel water systems.

9. Surveillance of legionnaires' disease

Legionnaires' disease is a statutorily notifiable disease in many but not all EU member states. Rates of disease vary from 1.0 to 30.0 per million population, depending on ascertainment and reporting procedures in individual European countries. However rates at the lower end of the range represent a considerable under-estimate of incidence and it is thought that the true number of cases may

be up to 20 times this figure. It is estimated that less than 5% of cases may eventually be reported to public health authorities through passive surveillance (13).

Studies that have tried to estimate the true incidence of community-acquired legionnaires' disease have found that *Legionella* species cause between 2% and 16% of community-acquired pneumonia cases in industrialised countries (14). One study in the UK showed that although uncommon overall, a diagnosis of legionella infection was more likely in severe cases of community-acquired pneumonia, accounting for 14-37% of cases, with an associated mortality rate in excess of 25% (15). Overall, *Legionella* species are probably the second-to-fourth-most common cause of community-acquired pneumonia (pneumococcal pneumonia is the most common cause).

There are several reasons why legionnaires' disease is under diagnosed and under reported:

- When a patient is diagnosed with pneumonia, treatment is generally started immediately. If the patient is treated with antibiotics that are effective against legionella, the patient usually recovers, without further need to establish the cause of the pneumonia;
- A small proportion of the diagnostic methods for legionnaires' disease lack sensitivity and specificity and may result in producing false negative results;
- Patients with a serious underlying disease involving immunosuppression are particularly at risk from legionnaires' disease. If these patients die, death may be attributed to their serious condition, without diagnosing the legionella infection;
- Cases of travel associated infection may be diagnosed in some countries but not forwarded to the national collaborator in the European surveillance scheme.

From the above, it can be concluded that the number of cases reported to the European surveillance scheme is a serious under estimate of the true incidence of travel associated legionnaires' disease.

10. European surveillance of travel associated legionnaires' disease

International surveillance has been shown to provide added value to national surveillance and to contribute to the detection, control and prevention of disease within and between countries. It requires close co-operation between European countries. Information about the surveillance scheme and its roles and functions is provided on the public part of the EWGLI website (www.ewgli.org). The scheme also fosters collaborations between European countries through the exchange of clinical and environmental specimens and the exchange of information which will further the epidemiological and microbiological knowledge of legionella infection.

11. Objectives of the European surveillance scheme

- To enhance the capability within the EU to detect common source outbreaks early, enabling member states to implement timely preventive action;
- To inform all those that need to know about travel associated legionnaires' disease in order to promote primary preventive action and collaborative investigations;
- To inform the European network about community acquired outbreaks of legionnaires' disease of potential international public health importance;
- To reduce the incidence of legionnaires' disease in residents of Europe through the support of active control and prevention programmes in each member state country;
- To improve the methods of communication for reporting and receiving information on legionnaires' disease.

12. Epidemiological methods

The European surveillance scheme is now an official disease specific network according to Decision 2119/98/EC. It adopted the name EWGLINET in May 2002 in order to distinguish it from the other activities carried out by EWGLI. Representatives from the national authorities with responsibility for public health in each member state oversee EWGLINET. They also nominate the official collaborators to participate in the scheme. These are normally one public health epidemiologist from their national public health institute or Ministry of Health and one microbiologist from their national or regional legionella reference laboratory. EWGLINET is currently managed by the co-ordinating centre at the Communicable Disease Surveillance Centre (CDSC) at the Health Protection Agency's Centre for Infections in London.

Individual cases of disease are reported by the nominated collaborators to the scheme's co-ordinating centre in London (CDSC). Case definitions for reporting are given in Appendix 1. With complete and rapid reporting the surveillance scheme can detect clusters of travel associated legionnaires' disease in residents from two or more European countries travelling to a single holiday destination or staying in the same hotel or other accommodation site. Receipt of the information leads to specific and timely action by collaborators to protect European residents travelling to countries inside and outside Europe.

As at January 2005, 49 collaborating centres in 37 countries (24 EU member states (including UK made up of England and Wales, Scotland and Northern Ireland) and 11 non-EU countries) were contributing or receiving data on travel associated cases. Liaison with other national authorities takes place if the travel associated infection is linked to countries outside Europe, e.g. the USA, South Africa, the Far East etc. Procedures for reporting cases of travel associated legionnaires' disease to tour operators were formalised and adopted by some European countries following the implementation of the EC Directive for Package Travel (90/314)(16) in 1996.

In 1999, the EWGLI website was developed and collaborators now transmit and receive case information via a secure part of this facility. All case reports are incorporated into the international database at CDSC which is then searched for other cases who may have stayed at the same place of accommodation at any time since 1987 when records began.

Cases are normally reported to the scheme by the country of residence of the case. The majority of cases are residents of northern European countries, e.g. the UK, France and the Netherlands and infection is mainly associated with countries in southern Europe. This pattern of illness reflects the migration from north to south of people going to specific holiday resorts for their holiday rather than any bias in susceptibility or reporting between north and south Europeans.

Great care has to be taken with the surveillance. There is a requirement for speed to provide health protection. However cases and clusters seemingly associated with specific hotels can arise by chance and the source of infection may be elsewhere. Also, since all cases require a confirmed laboratory diagnosis and many lead to investigations of environmental sources, it is essential that there be good, standardised microbiological testing and agreed good practices for investigation and response within and between European countries.

13. Results 1987-2004

The number of cases of travel associated legionnaires' disease reported to the European scheme has risen from less than a hundred per year in 1987 to over 600 in 2004 (17). This increase almost certainly reflects increased ascertainment and improved collaborations and reporting by the participating countries. Since 1987, the surveillance scheme has received details of over 4600 cases and over 7000 visits that were associated with almost 100 different countries worldwide. Approximately 35% of these cases were part of recognised clusters or cases linked to the same hotel or building over several years. The proportion of deaths reported each year range from 6% to 15% but are considered an under estimate as many countries are unable to provide mortality data.

The peak months in Europe for onset of legionella infection occur during the summer, the period when most people take their main holidays. August, which is the peak month for school holidays in Europe usually has a lower proportion of cases and suggests that older people who are more at risk of legionella infection tend to take their holidays outside this month. Cases in men outnumber cases in women by approximately three to one and the peak age of infection is between 50 and 65 years, although in recent years there has been an increase in the number of cases reported in those aged 75 years or more.

14. Related activities within EWGLI

Countries that participate in EWGLI are involved in microbiological and environmental studies that contribute to the further understanding and control

and prevention of legionella infections. The main objectives of this voluntary group are:

- To continue to support the European Surveillance Scheme for Travel Associated Legionnaires' Disease (EWGLINET);
- To collaborate on the investigation and control of legionnaires' disease;
- To continue to improve the laboratory support to participating laboratories in the scheme through the Health Protection Agency External Quality Assessment Scheme (EQA) for the detection of *Legionella* species in water;
- To establish and maintain a European EQA scheme for laboratory diagnostic methods including the detection of legionella urinary antigen;
- To extend the pan-European typing scheme for *L . pneumophila* serogroup 1;
- To develop strategies for the standardised identification and typing of non-pneumophila *Legionella* species.