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Original Research

Investigating a cluster of Legionnaires' cases: Public health implications

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SUMMARY

Objectives: To describe the multidisciplinary investigation and management of a rapidly increasing number of cases of Legionnaires' disease in the North Shropshire area, UK during August 2006.

Study design: Epidemiological and environmental investigation of a cluster of cases of Legionnaires' disease.

Methods: Outbreak investigation included: agreeing case definitions; case finding; epidemiological survey; identification and environmental investigation of potential sources; microbiological analysis of clinical and environmental samples; mapping the location of potential sources; and the movement and residence of cases.

Results: Three cases of Legionnaires' disease were admitted to a local hospital between 30 and 31 August 2006. Two of these cases were Shropshire residents, with the third living in Wales. A fourth case was also identified which, it was thought, may have been linked to this cluster as the patient had a history of travel to the same area as the two Shropshire residents. Over the next few weeks, three more cases were identified, two of whom were admitted to hospital. Subsequent detailed environmental, epidemiological and microbiological investigation did not support the hypothesis that any of these cases could be linked to a common source.

Conclusions: The results of this investigation strongly suggest that a single source was not responsible for the cluster, and it was concluded that this incident was a pseudo-outbreak. This investigation serves as a reminder that clusters can and do occur, and that an apparent outbreak may be a collection of sporadic cases distinguishable only by rigorous epidemiological, environmental and microbiological investigation.

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Introduction

Legionella pneumophila is widely distributed in the environment, and *L. pneumophila* serogroup 1 (LP1) is an important cause of sporadic cases and community outbreaks. Reported sources of infection in individual cases and outbreaks of Legionnaires' disease (LD) include air-conditioning units, cooling towers, whirlpool spas, fountains and domestic water systems.[1–5] Once an outbreak is recognized, public health agencies respond to the challenge in a coordinated way using a variety of investigative methods to confirm or refute identified epidemiological associations regarding potential sources of infection.[6]

Between August and September 2006, the Shropshire and Staffordshire Health Protection Unit received reports of six cases of LD over a 19-day period. This number was three times that observed for the same time period in this area in the previous 3 years combined, and occurred while England and parts of Europe were also experiencing large increases in cases of LD.[7–9] Initial investigations suggested a link to North Shropshire. A further potential case was identified as a result of intensive retrospective case finding. The initial working hypothesis was that this cluster had arisen as a result of exposure to a contaminated aerosol-producing device in the community. A multidisciplinary outbreak control team (OCT) was convened to determine the cause of the increase in cases seen and to implement control measures. This report describes the investigation conducted to determine the source of this cluster of cases, which turned out to be a pseudo-outbreak.

Methods

Background

North Shropshire is a predominantly rural area in the West Midlands, England that shares borders with Wales. It contains a number of small towns and villages, and had an estimated population of 59,500 in 2006.

Epidemiological

In an attempt to identify a common source, patients, or their relatives, were interviewed using a standard questionnaire to obtain demographic information and details on activities, places visited, routine and/or occasional exposure to aerosol-producing devices, and any history of travel with overnight stays.

Based on the guidance of the Health Protection Agency,[10] cases were defined as follows:

- *confirmed* – a person who had clinical or radiological evidence of pneumonia with microbiological evidence of *L. pneumophila* infection and lived, worked or had vested the North Shropshire area during the 14 days before onset of illness from 10 August 2006. Laboratory confirmation consisted of one or more of the following: culture of *Legionella* spp. from respiratory material, detection of *L. pneumophila* urinary antigen or seroconversion (a four-fold or greater increase in antibody titre between acute and convalescent sera against LP1); or
- *presumptive* – if there was clinical or radiological evidence of pneumonia and microbiological evidence of a single high antibody titre of 64 of *L. pneumophila* infection in a person who lived, worked or had vested the North Shropshire area during the 14 days before onset of illness from 10 August 2006.

Travel-associated LD cases were defined according to the European Working Group for Legionella Infections guidance as confirmed cases of LD with one or more overnight stays in holiday accommodation in the 10 days before onset of illness.[10]

LD is not statutorily notifiable in England and Wales; therefore, in order to identify other possible cases of LD in the resident population, local hospital doctors and general practitioners were informed by letter of the suspected outbreak, and they were requested to investigate suspected cases of atypical pneumonia and actively consider LD as a potential diagnosis. Additionally, all consultants in communicable disease control in England and Wales were alerted to the cluster, and asked to inform the OCT if they identified any cases of LD meeting the case definition. To further support case finding, a review was conducted of radiologically confirmed pneumonias (including current inpatients) seen at the Royal Shrewsbury Hospital, Shropshire between 10 August 2006 and 20 September 2006 with the aim of identifying new or unresolving cases of pneumonia.

A Geographical Information System (GIS) database was created in order to produce maps showing the location of potential sources of aerosol exposure, cases' residential location, workplace (where applicable), daily movement and wind direction.

Environmental investigation

Environmental health officers and Health and Safety Executive officers visited premises with registered cooling towers within a 2-mile radius of case residences and workplaces, and any that might have been implicated as a result of work or social activities. Additionally, the environmental health officers actively searched for other potential environmental aerosol sources, such as unregistered cooling towers and car washes within the same area. For each site with a cooling tower, maintenance log books were examined to assess compliance with legal requirements, and visual inspection of the top of each cooling tower was carried out. Enquiries were also made for staff absences with serious respiratory illness. Environmental samples obtained were water and swabs collected from cooling towers and community car washes, as well as the domestic water supply of Cases 2 and 5. All environmental samples were forwarded to the University Hospital of North Staffordshire National Health Service Trust, Microbiology Department, Stoke-on-Trent for isolation of *L. pneumophila*.

Epidemiological typing

The Department of Microbiology, Royal Shrewsbury Hospital, Shropshire analysed all available clinical specimens, and