CASE REPORT

Molecular diagnostics and the public health management of legionellosis

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t.yates@ucl.ac.uk**SUMMARY**

In 2009–2010, we investigated four *legionella* cases notified over an 8-month period in two adjacent villages in South East England. Molecular techniques enabled us to conclude that three of the cases had distinct infections. The absence of an adequate respiratory sample in one case necessitated epidemiological investigations to exclude a potential common environmental source of further infections. One of the cases had spent a part of their incubation period in a country in South East Asia. DNA-sequence-based typing of their isolate showed it to be of the *Legionella pneumophila* serogroup 1 (LP1) DNA-sequence type (ST) 481. Intriguingly, the only other two ST 481 isolates in the European Working Group for Legionella Infections database were among Dutch travellers to the same country in 2003 and 2006. This case makes clear the value of molecular diagnostics and the importance of obtaining adequate clinical specimens. The potential future uses for typing data are discussed.

BACKGROUND

Legionella is a not infrequent cause of community-acquired pneumonia.^{1 2}

Legionella is not spread from human to human. Rather, it is spread via aerosolised water from an environmental reservoir,³ such as a water cooling tower, an air conditioning system, domestic water supplies or⁴ windscreen washer fluid.

Given the severe course of some *legionella* infections,³ prompt identification of any common environmental source of infection is critical. Molecular diagnostic methods for *legionella* are not well understood by clinicians but are a critical tool in the public health management of cases of legionellosis. This case demonstrates their value.

CASE PRESENTATION

In an 8-month period in 2009 to 2010, the Thames Valley Health Protection Unit was notified of four cases of Legionnaire's disease, one fatal, among residents of two adjacent villages in South East England. Two lived on the same street.

INVESTIGATIONS

All cases were *Legionella pneumophila* urinary antigen test positive in the admitting hospital. Further testing, using an *L pneumophila* serogroup 1 mAb2 specific urinary antigen assay⁵ at the National Legionella Reference Laboratory, enabled us to exclude a common source in one of the four cases. Typeable respiratory isolates⁶ from two of

the other three cases again indicated an independent source in each.

The absence of an adequate respiratory sample in one case necessitated detailed epidemiological investigations to exclude a potential source of further infections in the Thames Valley. These included obtaining a detailed account of movements during patients' incubation periods; colleagues from local environmental health departments visiting the street on which two of the patients lived, as well as a healthcare facility visited by one of the patients during their incubation period, to look for sources of aerosolised water; inspection of water testing records at that healthcare facility and local cooling towers; and, given that one of our cases had spent part of their incubation period in a South East Asian country, a discussion with the European Centre for Disease Control to check that there were no other reported cases among travellers to the same places.

DNA-sequence-based typing (SBT)⁶ of a respiratory isolate from this cluster showed it to be LP1 sequence type (ST) 481. This was the patient who had spent part of their incubation period in South East Asia. Intriguingly, the only other two ST 481 isolates in the EWGLI SBT typing database (comprising more than 6000 isolates from more than 50 countries) were among Dutch travellers to the same country in 2003 and 2006. Whether this is a chance finding or a reflection of the geographical distribution of this ST cannot be assessed from so few cases.

OUTCOME AND FOLLOW-UP

Three of the four cases made a good recovery and there have been no further cases diagnosed in these villages.

DISCUSSION

Legionella was responsible for 3.7% of ambulatory cases and 3.8% of hospitalised cases of community-acquired pneumonia in a recent German multicentre study.¹ Ten per cent of cases are caused by species not detectable using the urinary antigen test.¹

Recent events in Stoke-on-Trent⁷ and Edinburgh⁸ demonstrate the potential human cost of outbreaks of legionellosis. The financial costs of the investigation and management of 14 cases in London in 2005 was estimated to be £455 856, with 86% of costs being hospital treatment of the disease.⁹

There are many published reports describing the utility of typeable respiratory isolates both in determining and excluding common environmental

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sources of infection in apparently clustered cases of legionellosis (see eg, Refs. ^{7 9–12}).

To date, only a few hundred clinical *L pneumophila* isolates have undergone typing in the UK. As a small subset of environmental isolates are responsible for clinical disease,^{13 14} environmental typing alone cannot describe the clinical epidemiology of legionellosis. Respiratory specimens not only have clinical and public health value but will, with time, allow the distribution of sequence types responsible for human disease to be better mapped. In the future, such data may allow the search for environmental sources of infection to be better targeted.

Learning points

- ▶ Respiratory isolates, ideally obtained early in the course of disease, allow sequence-based typing of *legionella*, which can inform a public health response.
- ▶ Respiratory isolates also allow diagnosis of non-LP-1 legionellosis, which is not detectable using the urinary antigen test.
- ▶ This report describes the utility of molecular diagnostics in the investigation of potentially linked cases of legionellosis.
- ▶ Apparently clustered cases of legionellosis may be 'pseudo-outbreaks' and ascertaining this using sequence-based typing can avoid expensive and unwarranted investigations.

Contributors TAY and TM originally investigated the *legionella* cases; they were advised in the matter by TGH. JPB provided details of the Dutch cases. TAY conceived and drafted the case report. TGH reviewed the manuscript and made substantial changes. All authors reviewed the text and approved the final draft prior to submission. TAY is the guarantor.

Competing interests All authors work or have worked on the public health management of legionellosis. TAY has worked on studies that received support from Pasante and GSK but did not benefit financially from these relationships.

Patient consent No patient identifiable information presented.

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