A community outbreak of Legionnaires' disease in South Wales, August–September 2010

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During August and September 2010, an outbreak comprising 22 cases of Legionnaires' disease was identified by the public health service in Wales. The cases are distributed over a wide geographical area in South East Wales. There are two space-time clusters centred on the upper Rhymney Valley and the lower Cynon Valley respectively. Epidemiological investigations are compatible with cooling towers in each location as the potential source, but environmental inspections were satisfactory and microbiological investigations are inconclusive.

Outbreak description

In mid and late August 2010, six cases of Legionnaires' disease, with no history of recent travel abroad, were reported to the public health service. All the patients tested positive for urinary antigen for *Legionella pneumophila* serogroup 1 (mAb2 positive), which is the most common cause of Legionnaires' disease in the United Kingdom (UK). There were 24 cases of Legionnaires' disease in Wales in 2009 and an average of 13 cases per year over the past 10 years. A multidisciplinary Outbreak Control Team was convened on 3 September 2010 and an outbreak of Legionnaires' disease was declared.

Epidemiological investigation

Active case finding was undertaken by alerting clinicians throughout Wales and by alerting public health professionals throughout the UK. All cases of Legionnaires' disease reported in Wales from 1 July 2010 to 30 September 2010 were reviewed. A probable outbreak-associated case was defined as a person with a positive urine antigen test for *L. pneumophila* and onset of symptoms after 1 July 2010, who lived in, or had visited, the outbreak area during the 14 days before onset of symptoms. The outbreak case definition was based on the European Union case definitions for Legionnaires' disease [1]. The outbreak area was defined as the 12 km corridor on either side of the Heads of the Valleys Road (A465). This is a major road that links South West Wales with South East Wales and the English Midlands. Over the next two weeks a further 16 cases of Legionnaires' disease were identified.

Environmental health officers from 10 county or city councils interviewed all cases as soon as possible after notification. Information on demographic factors and recent movements within and outside the outbreak area was collected for the 14–day period before the onset of symptoms. Patients' residence and movements, as well as the locations of cooling towers in the area, were mapped using a geographical information system in order to help generate hypotheses about potential sources of exposure.

Environmental and microbiological investigations

By law, all cooling towers and evaporative condensers in the UK are required to be registered with the local council [2]. Owners should also follow the Approved Code of Practice (ACOP) on their operation and maintenance [3]. The Health and Safety Executive (HSE) inspected registered premises in the Merthyr Tydfil, Blaenau Gwent, Rhondda Cynon Taff and Caerphilly county council areas to identify any operating deficiencies. A search was also undertaken for unregistered premises. In addition, other potential sources within the outbreak area that might generate aerosols such as car wash and jet wash facilities were visited and inspected by local authority environmental health officers. Water samples were taken from a wide variety of sources at all sites that were found to have operating deficiencies or that were epidemiologically linked to the outbreak and analysed for legionella by PCR and culture.

Environmental samples were sent to the Severn Trent Water Company laboratory for testing and to the Respiratory and Systemic Infection Laboratory (RSIL) of the Health Protection Agency for further typing. Patient samples were also collected and sent to RSIL

for testing and typing, in order to identify a match with the potential environmental source.

Results

Thirty-one patients with Legionnaires' disease with onset since 1 July 2010 were identified, 22 of whom met the outbreak case definition [1]. Dates of onset of symptoms ranged from 4 August to 10 September 2010 (Figure 1) and none had travelled abroad in the two weeks beforehand.

Cases had a median age of 65 years (range 38-86) and most had underlying medical risk factors that are known to be associated with Legionnaires' disease. There were 15 males and seven females. All 22 cases were admitted to hospital and two died (case fatality rate 7%). There were two distinct spatio-temporal clusters (Figure 2): a cluster of seven people in the upper Rhymney Valley (cluster A) and a cluster of six people in the lower Cynon Valley (cluster B) including one case linked to both. The clusters are located around 15km apart but both are within a 5 km radius of a cooling tower. Of the remaining 10 cases, two were epidemiologically linked to a retail premises outside the outbreak area and one was microbiologically linked to another premises outside the outbreak area. The source for the remaining cases is unknown.

Laboratory results

All cases tested positive for urinary antigen for *L. pneumophila* serogroup 1 (mAb2 positive). Respiratory samples were available for typing from 11 patients. *L. pneumophila* has so far been cultured/typed from four patients and typed directly from sputum in a further three. Six strains are different subtypes and/or genotypes and neither cluster A nor B can be clearly characterised (Table).

Environmental samples

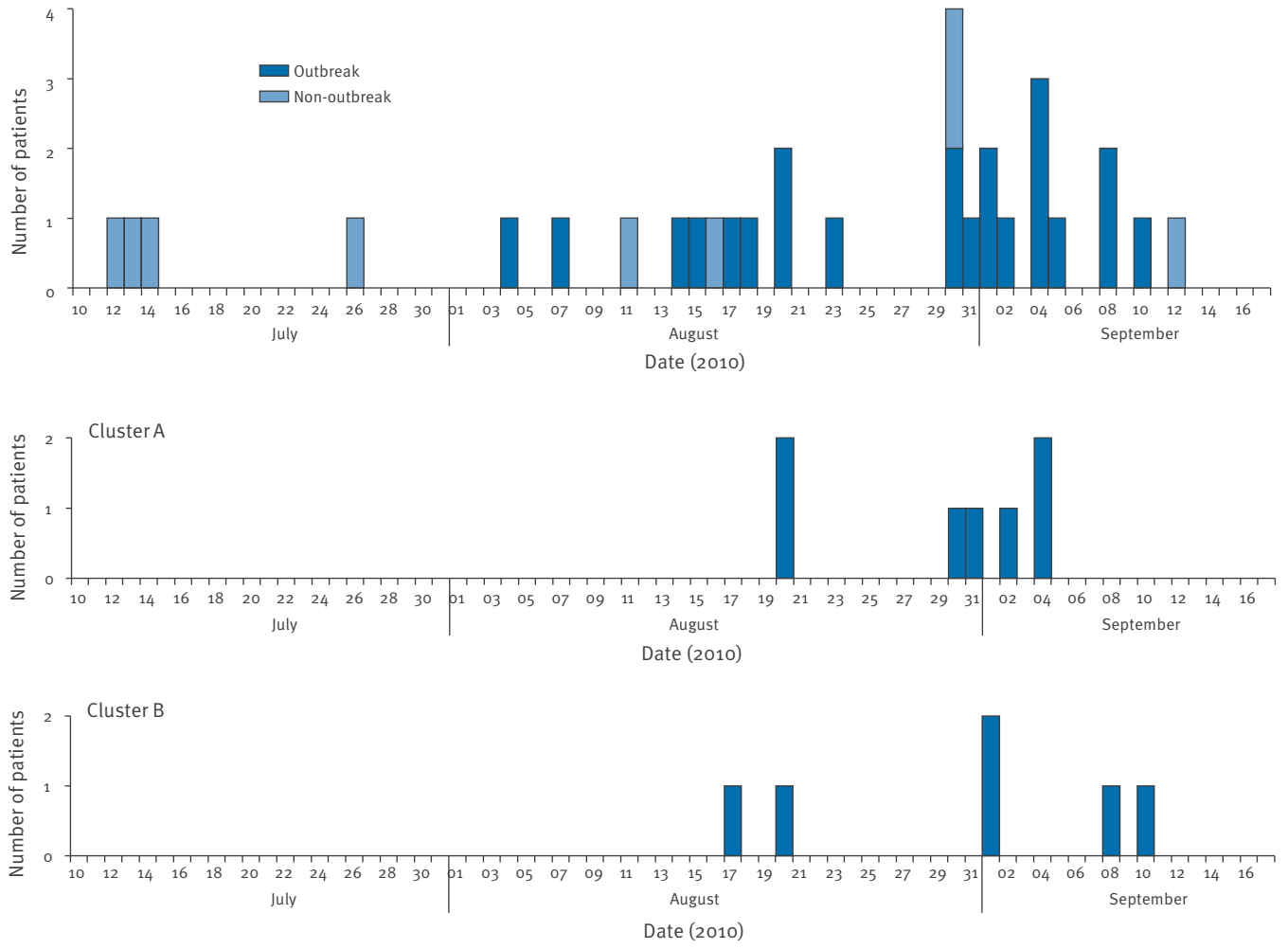
In total, 28 registered premises were visited by the HSE. Another three unregistered premises were identified and visited. A total of 26 environmental samples were collected and tested and all but one (linked to a single case not associated with either cluster) were negative on culture.

Control measures

In the vicinity of cluster A, there is a cooling tower and an air scrubber. Both were voluntarily closed down after inspection and the cooling tower was cleaned and

Figure 1

Patients with Legionnaire's disease by date of symptom onset, South Wales, July-September 2010 (n=31)

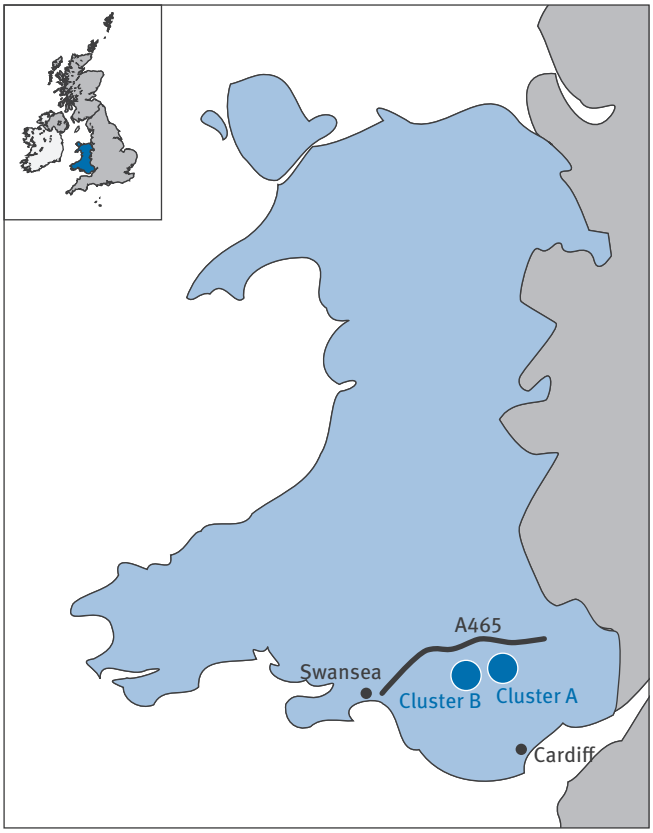


disinfected. Both have resumed normal operation following microbiological clearance. A cooling tower in the vicinity of cluster B was also closed, disinfected and re-opened following microbiological clearance. None of the sites has been definitively identified as the source of the outbreak.

In addition, a Prohibition Notice was served by the HSE at a site in Merthyr Tydfil. The notice was served as the cooling towers were not being operated in accordance with the Approved Code of Practice. Improvement Notices were also served on six further companies that were found to have minor deficiencies in their training, risk management policies, or maintenance procedures requiring them to improve the operation of their systems. None of these companies were located in the vicinity of Cluster A or B.

Figure 2

Location of clusters of Legionnaires' disease cases South Wales, August–September 2010



Discussion and conclusion

The outbreak investigation has so far identified two time-space clusters compatible with cooling towers in each location as the potential source. The outbreak has proved a particular challenge to investigate by virtue of the wide geographical distribution of cases, the identification of two distinct spatio-temporal clusters, the existence of different strains of *L. pneumophila* in cases, and the absence of *L. pneumophila* in environmental samples.

Previous outbreak investigations have identified geographical spread of *Legionella* up to 10 km from an industrial source [4,5]. However, even this would not explain the wide geographical distribution in this outbreak. Although the two clusters are only 15 km apart in a straight line, the topography comprises a series of hills and valleys and the road distance is considerably greater.

When microbiological results do not confirm a single source, or are contradictory, it can be difficult to decide if an outbreak is actually taking place [6]. The number of cases in this outbreak is clearly in excess of what would normally be observed in South Wales at this time of year. Some of this may be the consequence of heightened awareness and active case finding after declaration of the outbreak, but this does not explain the clustering of cases.

Investigations are continuing and some typing results are still awaited. So far, there has been only one successful match between an environmental and human sample. This highlights the importance of isolating and typing *Legionella* from as many clinical and environmental samples as possible to help identify the source [7,8]. The fact that no further cases have been detected since mid September 2010 indicates that the control measures taken appear to have been successful.

Table

Microbiological results from clinical samples, Legionnaires' disease outbreak, South Wales, August–September 2010

Case	Cluster	Sero-group	mAb[a]	Monoclonal antibody subgroup	Sequence-based type (SBT)
Case a	None	1	2	-	ST62[b]
Case b	Cluster A and B	1	2	Knoxville	ST615
Case c	Cluster A	1	2	Benidorm	ST898
Case d	None	1	2	Knoxville	ST902
Case e	None	1	2		SBT 12,0,0,0,0,0,0[b,c]
Case f	Cluster B	1	2	Knoxville	ST20
Case g	Cluster A	1	2		SBT 12,29,0,10,3,20,9[b,d]

[a] Monoclonal antibody type.
[b] By direct-nested PCR typing.
[c] Data obtained were insufficient to distinguish this strain from Case b or Case g.
[d] Unique strain.

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