

Public health response to an outbreak of Legionnaires' disease in Edinburgh, United Kingdom, June 2012

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We report an outbreak comprising 50 confirmed cases of Legionnaires' disease in Edinburgh, Scotland, June 2012. In addition, there were 49 suspected cases. Epidemiological evidence suggests that a common outdoor airborne exposure occurred over south-west Edinburgh. This probably emanated from cooling towers in the north-east of the affected area, although not yet clearly linked by scientific evidence. The co-ordinated public health, environmental and clinical response helped prevent ongoing exposure and mitigated associated mortality and morbidity.

In Scotland 15 to 40 cases of Legionnaires' disease occur annually, with approximately half travel-associated [1]. On 31 May 2012, a single case of Legionnaires' disease was reported and investigated in Edinburgh. After further notifications on 2 and 3 June, the number of reported cases of *Legionella pneumophila* infection in Lothian was four confirmed and four suspected. An incident management team (IMT) was convened on 3 June, in line with the Scottish Government framework for managing public health incidents [2].

During June 2012 the IMT met twelve times. The Scottish Government established their Resilience Room, a coordination facility activated in cases of crisis, on 5 June following an increase in cases. A helpline was established via NHS 24 (<http://www.nhs24.com/>) on 6 June and regular updates sent to clinicians and information leaflets distributed to affected areas of Edinburgh from 7 June onwards. The Chair of the IMT provided five television, radio and newspaper interviews on 6 June and twenty in total over the following four weeks.

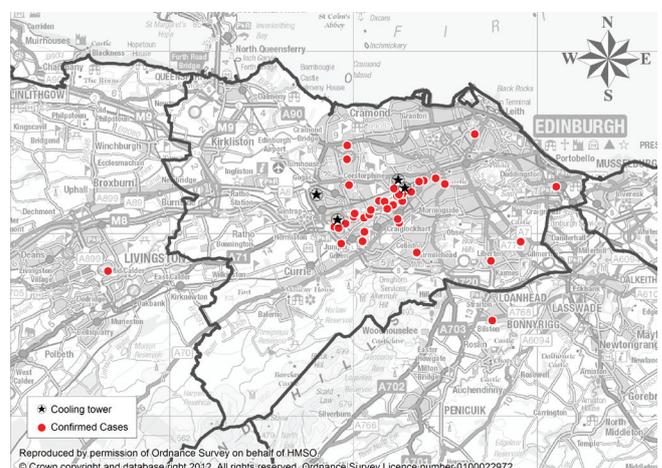
Epidemiological investigation

Mapping of cases (Figure 1) indicated that all were resident in or linked to south-west Edinburgh. Case definitions were based on European Union guidelines [3]. A confirmed case was defined as an individual with community-acquired pneumonia, microbiologically confirmed *Legionella pneumophila*, disease onset from 14 May 2012, based on the first case being notified 31 May and taking into account the incubation period, and with links to south-west Edinburgh. Based on

clustering of cases, location of cooling towers and the prevailing wind, the IMT hypothesised that the most likely source of infection was the cooling towers to the north-east of the area. Immediate action was taken to sample and disinfect potential sources under the Public Health etc. (Scotland) Act 2008 [4], implement active case finding and inform public health agencies across the United Kingdom (UK). The public were informed of symptoms of Legionnaires' disease on 3 and 4 June and advised to contact primary care services if unwell. Further epidemiological investigations were undertaken by the Lothian public health team and Health Protection Scotland. All cases were interviewed after notification to obtain 'travel diaries' for 2 weeks prior to onset of symptoms and ascertain place of residence and work. Descriptive epidemiology determined

FIGURE 1

Confirmed cases of Legionnaires' disease by place of residence, Edinburgh, United Kingdom, as of 1 July 2012 (n=50)



HMSO: Her Majesty's Stationery Office

Not included in the map are 5 of the 50 cases who were resident in other NHS boards.

dates of onset of illness, disease status and age, sex and spatial distribution. Wind conditions were modelled between 14 May and 5 June and 'travel diaries' analysed to determine the association between cases and likely exposure.

Environmental and microbiological investigations

All cooling towers are required by law to be registered with the local authority [5] and management of water-associated Legionella risks is measured against the standards in the approved code of practice [6]. In addition to the four sites with cooling towers identified on day one of the outbreak (see Figure 1), the City of Edinburgh Council (CEC) and the Health and Safety Executive (HSE) [7] identified a further 60 sites including cooling towers, sprinkler systems and industrial washing facilities. These sites were assessed for risk based on their location and nature, and visited by staff from the CEC and the HSE. Where appropriate, water samples were taken and any potential sources disinfected. Samples were tested for Legionella species by the CEC Scientific Services, the National Reference Laboratory and the Health Protection Agency with the intention to match any environmental isolates with human isolates.

Results

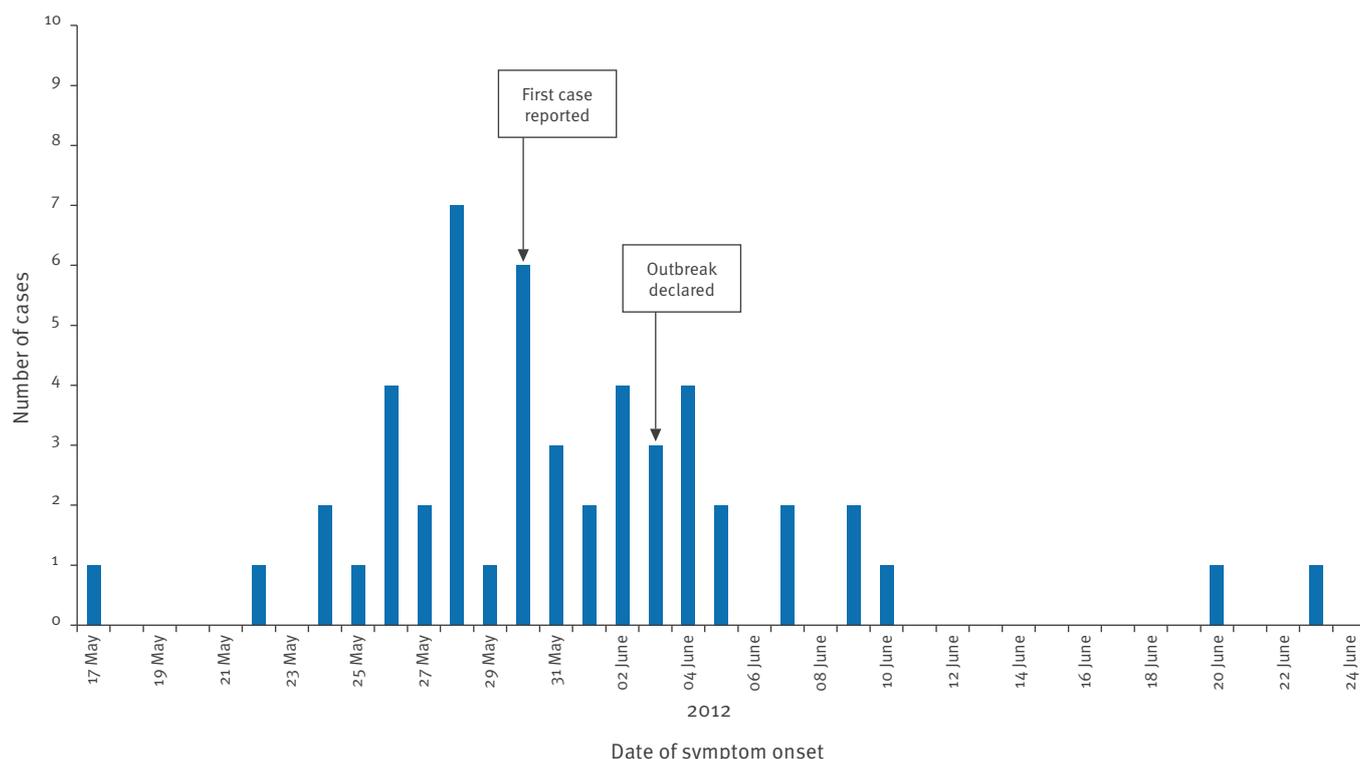
As of 1 July 2012, 50 confirmed cases have been identified. (see Figure 1) The average age was 56 years (range: 32–85 years), 72% were male and with two deaths amongst those confirmed to have Legionnaires' disease the mortality rate is 4.25%. A third death in a suspected case has also been reported. The confirmed cases were typical of Legionnaires' disease, predominantly males, smokers, aged over 50 years and with underlying health problems. There were also 49 suspected cases. Of the confirmed and the 49 suspected cases, 19 patients have received treatment in critical care and 52 patients on general wards. In addition, a large number of symptomatic individuals were assessed in the community.

The first date of onset was reported as 17 May. The epidemic curve of confirmed cases (Figure 2) shows a peak date of onset on 28 May. The peak in reporting was on 5 June. This pattern may reflect the combination of incubation period, increased case finding and increased public awareness.

The response from all clinical services was exceptional. Figure 3 shows the number of calls received by the NHS 24 helpline. Many of these callers would have

FIGURE 2

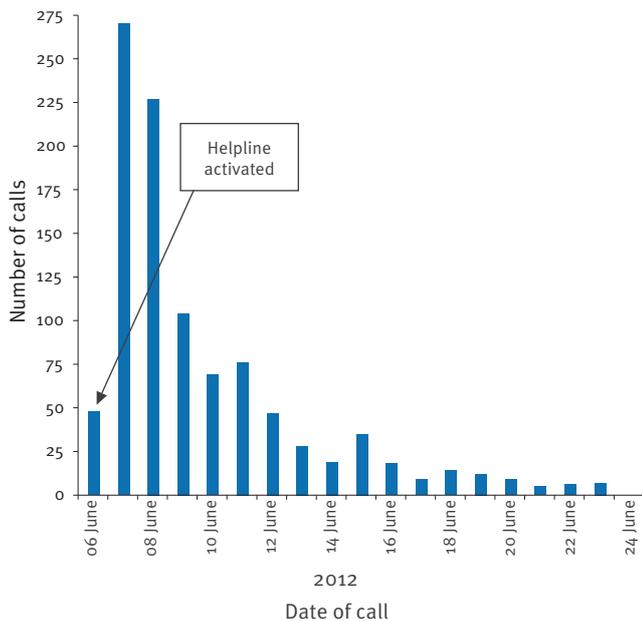
Confirmed cases of Legionnaires' disease by onset date, Edinburgh, United Kingdom, 17 May–1 July 2012 (n=50)



Source: NHS 24, 25 June 2012

FIGURE 3

Calls to the NHS 24 helpline, Edinburgh, United Kingdom, 6–23 June 2012 (n=1,003)



Source: NHS 24, 25 June 2012

been directed to consultations of general practitioners. The peak in demand on 7 and 8 June coincides with the first day the information leaflets were distributed to the public.

Epidemiological and meteorological evidence suggests that a common outdoor airborne exposure occurred over south-west Edinburgh, most probably emanating from the cluster of cooling towers in the north-east of the affected area between 23 May and 6 June 2012.

Microbiological results from 50 cases showed the presence of *Legionella pneumophila* serogroup 1. An additional 1,444 urine samples tested negative, as well as 557 sputum samples (some patients submitted both samples). After extensive environmental testing there is, as of 1 July, no current microbiological evidence to confirm the presence of *Legionella pneumophila* in any of the samples taken from potential sources. However, voluntary closure of cooling towers was attained from 7 June and since then eight improvement notices have been served to companies in the area by the HSE and CEC under the Health and Safety at Work etc. Act [8]. There is an ongoing joint investigation by Lothian and Borders Police and the HSE into the three deaths, with the HSE also investigating compliance with legal standards.

Discussion

The outbreak reported in Lothian is the largest in Scotland to date. In the last ten years, significant community outbreaks of Legionnaires' disease associated with cooling towers have occurred in the UK and elsewhere in Europe [9]. Other outdoor sources include industrial air scrubbers (Norway) [10], decorative fountains (Wisconsin) [11] and hot water systems (Denmark) [12]. The largest recorded European outbreak was in Murcia, Spain (449 cases) [13] and the largest in England was Barrow in Furness (185 cases) [14].

The current outbreak in Edinburgh occurred in a densely populated area of the capital city and the cluster of cases was well demarcated. This may be due to population density, the north-easterly wind and the topography as the area (Figure 1) is built up in a valley creating 'urban canyons' which can channel air flow. A significant proportion of Edinburgh's population may have been exposed to the plume because a main route from the city centre towards the two major motorways and the airport goes through the affected area.

Whilst expected mortality is often in excess of 10%, the low mortality observed (4.3% in the confirmed cases) may suggest that the timing and quality of care plus the proactive communication strategy may have mitigated the impact. The clustering of the dates of onset indicates a point source exposure which has now stopped and suggests that the potential sources were correctly identified and effectively treated at the beginning of the outbreak. Ongoing epidemiological investigations include sero-prevalence and case-control studies. The aim is to assess the extent and gradient of disease in the community, and the characteristics of those who developed Legionellosis.

Members of the Incident Management Team:

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