An outbreak of Legionnaires' disease associated with a display spa pool in retail premises, Stoke-on-Trent, United Kingdom, July 2012

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Twenty-one confirmed cases of Legionnaires' disease (*Legionella pneumophila* serogroup 1) were identified in the Stoke-on-Trent area of England with onsets since 2 July 2012. Sequence-based typing results are available for nine cases; all are a unique type (ST1268). Initial interviews highlighted a number of possible environmental sources. Inspection of premises of interest revealed an operating spa pool on display, from which the outbreak strain was identified. All cases had visited the retail premise with this spa pool.

On 20 July 2012, public health authorities in the West Midlands, England, were notified of two confirmed cases of Legionnaires' disease (LD) in Stoke-on-Trent residents admitted to the local hospital in the previous week. Initial interviews identified no possible shared exposures, and indicated that neither patient had travelled abroad or in the United Kingdom (UK) during their incubation periods. A review of previous notifications identified two earlier cases resident in this area, one in May and one in June 2012; both had spent part of their incubation periods abroad.

The local Health Protection Unit notified local enforcement agencies and convened an outbreak control team on 23 July 2012 to coordinate investigations, control measures, and public communications, as well as the response by local agencies. This paper describes the preliminary findings of this investigation and summarises data available at 14 August 2012.

Investigation

The reporting hospital is the only acute care facility serving the residents of Stoke-on-Trent and surrounding districts, a population of approximately 500,000. Active case finding involved close liaison with the microbiology department and medical staff at the

hospital, referral of pneumonia cases by hospital clinicians for microbiological testing, and encouraging respiratory sample collection on *L. pneumophila* urinary antigen-positive patients where possible. Regular letters were sent to all general practitioners (GPs) in the local area asking for vigilance in detecting potential cases, all surrounding hospitals and laboratories were informed to be vigilant and report associated cases, all Health Protection Units across England were briefed, and all national Legionella case reports reviewed.

Case definitions

A confirmed case was defined in accordance with the definitions from the European Centre for Disease Prevention and Control (ECDC) as a person with clinical or radiological evidence of pneumonia and laboratory confirmation by culture of *Legionella pneumophila*, by detection of *L. pneumophila* urinary antigen or by seroconversion against *L. pneumophila* serogroup (sgp)1 [1], and with both an onset date after 30 June 2012 and a history of living in or visiting the Stoke-on-Trent area in the 14 days before onset.

A possible case met the same definition, but with an onset date from 2 May 2012.

Epidemiological investigation

All detected cases were interviewed with a standard questionnaire within one day of notification, covering details of clinical risk factors, where they lived, worked and visited over the 14 days before becoming ill, including movement routes and visits to or nearby water systems with the potential to be a source of exposure. When cases reported a potential risk site (e.g. a car wash) or any site was mentioned by more than one case, all other cases were re-questioned to determine if they had also visited there.

FIGURE

Legionnaires' disease cases, by date of onset and case status, Stoke-on-Trent area, May-August 2012 (n=23)

Preliminary results

As of 14 August 2012, 21 confirmed cases have been identified. Two possible cases with earlier onset have also been re-investigated. All cases live in and around Stoke-on-Trent. The median age of cases is 64 years (range 48–79 years) and 14 of 21 are male. Most cases had existing underlying medical conditions and all were admitted to hospital, where two died. A review of risk factors for disease onset in cases is underway.

All the cases have onset dates from 2 July to 2 August 2012. The epidemic curve (Figure) shows a peak onset (12/21 cases) between 17 and 21 July, with the majority of those 12 cases occurring from 18 to 20 July (9 cases).

Microbiology of case samples

All cases were positive for *L. pneumophila* sgp 1 urinary antigen [2]. Sputum samples were obtained from 11 cases, and direct DNA-sequence based typing (SBT) [3] of the nine *L. pneumophila* PCR-positive sputum samples identified the same strain (a previously unrecognised sequence type designated ST1268); SBT was not attempted on the two PCR-negative samples. In six cases legionellae have been cultured and the infecting strain confirmed as *L. pneumophila* sgp1, mAb subgroup 'Benidorm', ST1268.

Environmental investigation

All six active registered cooling towers in Stoke-on-Trent were contacted by Health and Safety Executive (HSE) and local authority (LA) inspectors over the weekend 21–22 July to confirm adherence with the nationally approved code of practice for the control of Legionella bacteria in water systems and institute control measures if indicated [4]. Two towers in adjacent districts

were included later. Towers were inspected and water samples and swabs of biofilm were taken, although for five of the Stoke-on-Trent towers, this was after initial control measures had been implemented by the owners. All cooling towers were negative by *L. pneumophila* PCR except one of the towers with poor epidemiological fit to the outbreak, which was positive for *L. pneumophila* sgp1ST62, but not the outbreak strain. This was subsequently confirmed by culture of *L. pneumophila* sgp1, mAb subgroup 'Allentown/France', ST62. All other towers were found to be culture-negative.

Case interviews identified overlapping locations and local travel routes pointing to an area of south Stoke-on-Trent for further environmental investigation and assessment of potential water sources. This area was systematically investigated by the HSE and LA, and more than 30 sites (including light industry, engineering works, retail, car washers, dry cleaners, and public fountains) were assessed. Five sites containing water systems with the potential to be a source were inspected and sampled. All samples from these sites were negative in PCR and culture.

Three retail sites common to more than three cases were identified: all 21 cases reported visiting one particular retailer (A), 20 of them definitely within the incubation period for the organism, 14 visited another retailer (B) and 10 visited a third (C). Assessment of these three sites found two to have potential sources of exposure: an operating display spa pool (site A) and garden fountains/water features (site B), all of which were drained and disconnected. Samples from site B were negative in PCR and culture. A swab sample (water samples were not available) from the spa pool

identified the outbreak strain (ST1268) by PCR and direct SBT. Attempts were made to culture *L. pneumophila* from swab sample concentrates, but have to date not been successful. Maintenance and the use of biocides during the five months the spa pool was operating and on display prior to decommissioning on 24 July are being investigated in detail. On 30 July 2012, seven days after convening the outbreak control team, the media were briefed that the spa pool was the probable source of the outbreak.

Discussion and conclusions

The epidemic curve and the molecular typing results were highly suggestive of a common source for this outbreak. The use of rapid and detailed investigation techniques confirmed that all cases had visited the indoor retail premises with the display spa pool, and the same, previously unrecognised, strain has been found in all cases tested and in the spa pool. This strain has not been found in any other site tested and no other site had such a strong epidemiological link to all cases. Operating spa pools on display in indoor spaces, even if not used for bathing, have been shown to be the cause of previous outbreaks [5-16]. Although the possibility of ongoing exposure from other sources cannot yet be completely ruled out, the epidemic curve is consistent with the source having been removed on 24 July (the date the spa pool was drained), and no further cases have been identified with disease onset after 2 August.

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