

Outbreak report

COMMUNITY OUTBREAK OF LEGIONNAIRES' DISEASE IN VIC-GURB, SPAIN IN OCTOBER AND NOVEMBER 2005

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This paper reports the investigation of a community-acquired outbreak of Legionnaires' disease in the municipalities of Vic and Gurb (Central Region of Catalonia, Spain). There were 55 cases reported in October and November 2005. An epidemiological and environmental investigation was undertaken. Thirty-five case patients (64%) lived in Vic or Gurb, while 36% had visited or worked in Vic or Gurb during the 10 days before onset of symptoms, but no commonly frequented building could be identified. Water probes for culture were obtained from 30 cooling towers. In five cooling towers of two industrial settings in Gurb (plants A and B), *Legionella pneumophila* (Lp) serogroup 1 was present. Two Lp-1 strains were recovered from cooling towers in plants A and B. The Lp-1 strain from plant A showed a PGFE profile identical with those obtained from three patients. The exposure to *Legionella pneumophila* apparently occurred in a large area, since 43 of the 55 cases lived, visited or worked within a distance of 1,800 m from plant A, and six cases in a distance between 2,500 and 3,400 m. The inspections of cooling towers in plant A revealed inadequate disinfectant doses of biocide, non-existent maintenance records on weekends and wrong sample points for routine microbial check-ups. Weather conditions in October 2005, template temperature and high humidity (wind conditions are unappreciable) could have been favourable factors in this outbreak together with the flat terrain of the Gurb and Vic area, explaining the extensive horizontal airborne dissemination of contaminated aerosols. The outbreak could have been prevented by proper and correct maintenance of the cooling tower at plant A.

Introduction

Legionnaires' disease is an atypical pneumonia caused by bacteria of the genus *Legionella*. Inhalation of aerosolised water containing legionella bacteria is the primary mode of acquiring Legionnaires' disease [1,2]. The incubation period for most of the reported outbreaks of Legionnaires' disease varies between two and 10 days. The Legionnaires' disease outbreak in Vic and Gurb (Central Region of Catalonia, Spain) was detected on 26 October 2005, when three patients with Legionnaires' disease were reported from Vic General Hospital to the Epidemiological Surveillance Unit Central Region (ESUCR). All three patients resided in Vic, a city of 37,800 inhabitants, and the symptoms' onset was between 16 and 22 October, so a common source of contamination was suspected. This paper describes the outbreak, the environmental investigation and control measures implemented.

Method

For the investigation of this outbreak, the following case definition was used: a confirmed case of Legionnaires' disease

was defined as a person with clinical symptoms of pneumonia, radiologically confirmed pneumonia and laboratory evidence of infection with *Legionella pneumophila* serogroup 1 (Lp-1), with onset of symptoms after 1 October, who lived in or visited Vic or Gurb (a Vic neighbourhood of 2,200 inhabitants) during the incubation period of the disease (1 October was chosen because it was two weeks before the onset of illness in the first case). Laboratory confirmation included isolation of Lp-1 from respiratory secretions or tissues, detection of Lp-1 antigens in urine, or 4-fold increase or more, titre levels $\geq 1/128$, in Lp-1 specific antibodies by immunoassay.

Information on case patients was collected using a standardised questionnaire asking about demographic data, clinical symptoms and their onset, medical history, medical care related to the illness, mobility within the affected communities (journeys to home and work, journeys to home and leisure), outdoor activities, housing conditions and other settings associated with exposure in outbreaks of Legionnaires' disease such as travel, hotels, hospitals, spa baths.

An environmental investigation was performed by the Environmental Health Unit (EHU) of the Health Department Territorial Services inspecting cooling towers and sampling water probes for further analysis. Locations of cooling towers were obtained from the legal cooling tower census of Vic and Gurb; however, the EHU searched for other cooling towers checking registries of industrial and commercial activities and scrutinising buildings suspicious as well as taking aerial views.

Meteorological data for September and October 2005 were obtained from the registry of the meteorological station located in the inner city of Vic at the University campus, prevalent temperature, humidity, atmospheric pressure, wind, and rainfall were analysed. The Student's t-test was used to compare mean values in order to assess if climate variables changes could have led to this outbreak or could explain the geographic distribution of cases and the shape of the epidemic curve.

All isolates of Lp-1 from environmental samples and clinical samples from patients were analysed using the pulsed-field gel electrophoresis – Sfil method (PFGE).

Results

Between 26 October 2005 and 9 February 2006, a total of 55 cases of Legionnaires' disease were notified to the ESUCR, with dates of symptoms' onset between 14 October and 19

November (Figure); in five cases, the reported onset of symptoms was 10 or more days after contaminated cooling towers had been disinfected.

Among the cases 48 patients were male and seven female, the median age of the affected was 52 years (range 35-92 years). Five (9%) required Intensive Care Unit admission whereas only four cases (7%) were not admitted to hospital. The average length of hospital stay was seven days (range 1-23 days). Three patients died, leading to a case fatality rate of 5.5%.

The most prevalent risk factor for Legionnaires' disease in this outbreak was smoking. The table shows the most frequent risk factors in case patients reported by the questionnaire.

Thirty-five case patients (64%) lived in Vic or Gurb, while 36% had visited or worked in Vic or Gurb during the 10 days before onset of symptoms, but no commonly frequented building could be identified.

Laboratory diagnosis was obtained by urinary antigen test except for one case which was diagnosed by serology. Lp-1 was confirmed in samples of three patients. All three isolates shared an identical PFGE pattern.

FIGURE
Cases of Legionnaires' disease by date of onset of symptoms and date of environmental interventions, outbreak in Vic and Gurb, Spain, October – November 2006 (n=55)

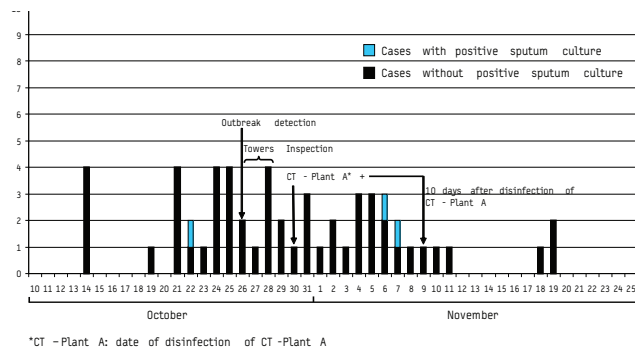


TABLE
Risk factors for Legionnaires' disease among cases, outbreak in Vic and Gurb, Spain, October – November 2006 (n=55)

Risk factor	Percentage
Smoking	42.6%
Diabetes mellitus	16.7%
Chronic bronchitis	14.8%
Corticosteroid therapy	7.4%
Alcoholism	5.6%
Cancer	5.6%

Water probes for culture were obtained from 30 cooling towers. In five cooling towers of two industrial settings in Gurb (plants A and B), Lp-1 was present. Bacterial counts were 104 – 105 cfu/L in plant A and 102 – 104 in plant B. The inspections by the EHU revealed inadequate disinfectant doses of biocide and non-existent maintenance records on weekends. *L. pneumophila* did not grow from water samples of cooling towers in plant A and on routine inspections in the months prior to the outbreak but sample points for those routine microbial check-ups were in close vicinity to the disinfectant entry into the cooling towers.

On 30 October, as soon as the environmental isolates were known to be Lp-1 positive, cleaning and shock treatment with hypochlorite of the cooling towers' systems was carried out. After shock treatment continued, chlorination was implemented with dose at 2 ppm chlorine or more. The cooling towers remained negative for *L. pneumophila* in the following investigations three weeks and two months afterwards. Plant A is located in northern Gurb bordering the city of Vic. Data analysis showed that the distance of exposure of the cases from the plant A ranged from 250 to 2,680 m, but 50% of cases occurred within a distance of 1,800 m or more.

Data obtained from the meteorological station located in the University of Vic showed only six days of mild rain in September 2005 and four days, again of mild rain, in October 2005. A statistically significant difference was observed on relative humidity ($p < 0.005$) and temperature ($p = 0.005$) between September and October 2005. In September, the mean air humidity was 73% (range 44% to 91%) and the mean temperature 17.8°C (range 5.8 to 32.4), whereas in October the mean humidity was 83% (range 59% to 95%) and the mean temperature 14.4°C (range 5.6 to 24.4). The median direction of the wind during September and October was around 190° at very low speed (3.6 Kph). Two Lp-1 strains were recovered from cooling towers in plants A and B. Lp-1 strains from plant A showed a PGFE profile identical with those obtained from three patients.

Discussion

This widespread Legionnaires' disease outbreak which affected at least 55 patients is the first located in Vic and Gurb. The fact that PFGE results for isolates obtained from environmental samples and clinical samples from affected patients were identical hints at a common source of this community outbreak, with the cooling tower of plant A in Gurb the most likely source.

The first four cases with onset of symptoms on 14 October 2005 were notified after 12 days, so it is possible that the date of onset could not be well established. Five cases occurred 10 days after the shock treatment of the cooling towers was undertaken: this suggests a longer incubation period in this outbreak. In fact, the incubation period during most outbreaks has been reported to be between two and 10 days, with a median between four and six days and outliers from one to 28 days [3].

The exposure to *L. pneumophila* apparently occurred in a large area, since 43 of the 55 cases lived, visited or worked within a distance of 1,800 m from plant A. For a further six cases the distance was between 1,800 and 2,500 m, and for the remaining six cases it was between 2,500 and 3,400 m. These results are consistent with findings from other published studies, which showed a distance of airborne transmission up to 3,200 m and 6,000 m [4,5], whereas other outbreak investigations have shown more limited distances [6,7]. Weather conditions in October 2005, template temperature

and high humidity (wind conditions are unappreciable) could have been favourable factors together with the flat terrain of the Gurb and Vic area, explaining the extensive horizontal airborne dissemination of contaminated aerosols [8]. Therefore, in this situation even people mostly confined to their homes at more than 2,000 m from plant A could become infected.

As a result of the investigation, the authors conclude that the outbreak described could have been prevented by proper and correct maintenance of the cooling tower at plant A.

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