

Cluster of Legionnaires' disease associated with a public whirlpool spa, France, April – May 2010

C Campese (c.campese@invs.sante.fr)¹, D Roche², C Clément², F Fierobe³, S Jarraud⁴, P de Waelle², H Perrin³, D Che¹

1. Institut de Veille Sanitaire (InVS, French Institute for Public Health Surveillance), Saint-Maurice, France

2. Délégation Territoriale de l'Agence Régionale de Santé des Ardennes (Regional Health Agency, district level), France

3. Agence Régionale de Santé Champagne-Ardenne (Regional Health Agency), France

4. Centre National de Référence des Legionella (National Reference Centre for Legionella), Hospices Civils de Lyon, Faculté de Médecine Laennec, Université Lyon1, France

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In May 2010, a cluster of three cases of Legionnaires' disease was identified in France. The results of the epidemiological, environmental and microbiological investigations allowed the rapid identification of a public whirlpool spa as the most probable source of contamination and the implementation of appropriate control measures. This investigation has stressed the need for good cooperation between partners and the importance of the molecular analysis of *Legionella* strains.

Background

Legionnaires' disease is an atypical pneumonia caused by the inhalation of aerosols contaminated by *Legionella* [1]. *Legionella* are ubiquitous bacteria and can grow in natural and man-made environments. Aerosol-generating devices such as wet cooling towers and water systems are well documented as sources of Legionnaires' disease [2]. Spas have also been widely acknowledged as a source of exposure in outbreaks [3-5].

In May 2010, three cases of Legionnaires' disease were registered by the local health authority in a district in the north-east of France (the Ardennes). These cases had visited the same spa centre during the 10-day period before the onset of symptoms. This paper describes the cluster, the investigation and the control and prevention measures implemented.

Methods

In France, notification of Legionnaires' disease is mandatory and the local health authority is in charge of the implementation of epidemiological and environmental investigations. Cases or their relatives are systematically interviewed using a standardised questionnaire. The objectives are to assess risk factors for contracting the disease, to identify a possible source of exposure and to rapidly detect clustered cases or outbreaks, in order to implement appropriate prevention and control measures. If necessary, the environmental team of the local health authority investigates the potential sources of contamination and collects water samples

for laboratory analysis. *Legionella* strains from clinical and environmental samples are analysed by the National Reference Centre for *Legionella*. Three methods are used: international monoclonal antibody sub-grouping [6], pulsed-field gel electrophoresis (PFGE) typing according to standard procedures [7] and sequence-based typing using standard European procedures [8].

Results

Descriptive epidemiology

The three cases were confirmed cases according to the national [9] and European Union case definitions [10]. All patients had symptoms of acute lower respiratory tract infection and were hospitalized.

Case 1

In early May 2010, the local health authority of a district in the north-east of France (the Ardennes) received notification of this case, a woman in her early 70s, presenting with an underlying chronic disease that increases risk of Legionnaires' disease. She was diagnosed only by a positive urinary test (no strain was isolated from a respiratory specimen). This patient had visited a spa centre towards the end of April, without using the whirlpool spa; she used a sauna located inside the room containing the whirlpool spa. She developed symptoms three days after visiting the spa centre and recovered after treatment with antibiotics.

Case 2

Four days after the notification of Case 1, a second case was notified: a woman in her early 50s. Immediate interview was not possible. She was diagnosed by a positive urinary test and presented tobacco smoking as a risk factor. One respiratory specimen was collected and a *Legionella* strain was isolated. Two days after notification, she died, despite intensive treatment including antibiotics. Her relatives were interviewed the day after she died and indicated she had visited the same spa centre six days after Case 1 had and had stayed in the room containing the whirlpool spa.

Case 3

Sixteen days after the notification of Case 1, a third case was notified: a man in his early 30s, presenting no risk factors. He was diagnosed by positive urinary test. A respiratory specimen was also available for this case and a *Legionella* strain was isolated. The patient had visited the same spa centre as Cases 1 and 2 had and had used the whirlpool spa. He had visited the spa centre 17 days after Case 1 had and developed symptoms (digestive disorders first, and then cough and fever) four days after his visit. The case recovered after treatment with antibiotics.

Investigation and control measures

Three days after the first case notification, an environmental investigation was carried out at the spa centre. Water samples from the whirlpool pump output were collected and control and prevention measures were advised. Three days after the second case notification, the local health authority decided to stop the use of the whirlpool spa. The national and regional health authorities recommended closing the spa centre two days later. In parallel, as the three cases lived in the same area, an investigation was undertaken to look for other possible sources of contamination. Three cooling towers were investigated: one was closed during the exposure period of the three cases; in the other two cooling towers, routine control samples were negative for *Legionella*.

A decision to undertake active case finding was taken following the notification of the second case. A request for immediate notification of new cases was sent to the local hospitals and general practitioners in the vicinity of the spa. Five days after notification of the second case, the local administrative authority issued a press release in order to inform people who might have visited the spa centre during the previous 14 days and to encourage them to visit their general practitioner if they developed symptoms. Case 3 visited his general practitioner after receiving this information. No other case has been notified.

Analysis of the samples from the whirlpool spa, available the day after use of the whirlpool spa was stopped, showed contamination with *Legionella pneumophila* serogroup 1 (Lp1) at a level of 150,000 colony-forming units per litre. Five *Legionella* strains from environmental samples were sent to the National Reference Centre for *Legionella* for genomic analysis and comparison with the two strains from the clinical samples (Cases 2 and 3). The Lp1 strains from the clinical and environmental samples shared the same characteristics: they were indistinguishable by monoclonal antibody sub-grouping (Allentown/France) and by sequence-based typing (sequence type 23) and they had the same PFGE profile. These strains were not considered as endemic strains: among more than 2,500 clinical isolates collected during the last 10 years and typed by the National Reference Centre, only one, isolated in 2009, had the same PFGE profile associated with monoclonal antibody subgroup Allentown/France and sequence

type 23. The corresponding patient had not visited the spa implicated in the April – May 2010 cluster.

Discussion and conclusions

The epidemiological, environmental and microbiological investigations allowed the rapid identification of the whirlpool spa as the most probable source of this cluster and the implementation of control measures. On the day the relatives of Case 2 were interviewed, the local health authority immediately decided to stop the use of the whirlpool spa.

The speed of a response may influence the dimension of clusters and outbreaks. Several conditions must be satisfied in order to rapidly identify and control a source of contamination. Firstly, cases have to be notified as soon as the diagnosis is established and then interviewed as soon as possible, in order to be able to build a hypothesis about the potential source(s). For this purpose, it is essential to have a standardised questionnaire, which helps to gather all the relevant information about the exposure. Secondly, it is essential to have clinical specimens for comparing the genomic profiles of the strains and to obtain strong evidence for confirming the source of contamination. In France, bacterial culture of respiratory samples is recommended for all cases with a positive urinary test and clinicians are regularly reminded about this recommendation.

The percentage of cases for which a *Legionella* strain has been isolated is stable in France, at around 18% during the past 10 years. Even if the culture result often does not change the diagnosis and treatment – particularly for cases with Lp1 infection diagnosed by urinary test – there should be further effort to increase the number of strains isolated from cases. Otherwise, as a result of the delay between exposure and the recognition of a cluster, the conditions in the suspected sources may have changed by the time they are investigated, thus limiting the capacity to identify the source of contamination [11]. For example, whirlpool spas may have been repeatedly drained and disinfected and analysis of water samples could remain negative [12]. The local team responsible for environmental investigation must be informed and trained in the best procedures for sampling such installations and equipment (e.g. swab samples of biofilms and samples of aerosol collections).

This cluster highlights once again the importance of ongoing vigilance regarding the proper maintenance of the water in spa pool facilities and the importance of a reactive surveillance system.

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