Probable Person-to-Person Transmission of Legionnaires' Disease

TO THE EDITOR: Legionnaires' disease is an often severe form of pneumonia that is typically acquired by susceptible persons (e.g., elderly persons and smokers) through inhalation of aerosols that contain legionella species.[1-4] A cluster of cases of this disease occurred in Vila Franca de Xira, Portugal, in 2014.[5]

One of the first cases of disease in this cluster occurred in a 48-year-old man (Patient 1), a smoker, who had been employed since October 6, 2014, as a maintenance worker at an industrial cooling tower complex in Vila Franca de Xira that was subsequently found to be contaminated with *Legionella pneumophila*.[5] He returned to the home that he shared with is mother in Porto (approximately 300 km from Vila Franca de Xira) on October 11 and again on the evening of October 19 (Fig. 1). His symptoms began on October 14, and on October 19, he had severe respiratory symptoms, including an intense cough. During that night, his mother (Patient 2) took care of him until he was admitted to the hospital (Centro Hospitalar do Porto) approximately 8 hours later. On October 22, he was transferred to another hospital to receive extracorporeal membrane oxygenation.

On October 27, Patient 2, who was a previously healthy 74-year-old woman, began to report fever, cough, and loss of appetite. She was admitted to the same hospital on November 3 with septic shock due to pneumonia, and she died on December 1. Patient 1 died on January 7, 2015.

Urine specimens obtained from both patients showed positive results on testing for legionella antigens with the use of a commercial enzyme immunoassay (Binax), and legionella was grown in culture from respiratory secretions. *L. pneumophila* serogroup 1 was identified, and strains were sent to the National Institute of Health in Lisbon for sequence-based typing and whole-genome sequencing (details are provided in the Methods section in the Supplementary Appendix, available with the full text of this letter at NEJM.org). Samples from the patients were obtained and processed more than 2 weeks apart (for culture and sequence-based typing) and 4 weeks apart (for whole-genome sequencing) to minimize the risk of cross-contamination. Both strains showed the novel ST1905 profile (identified as the causative strain in the cluster[5]), and whole-genome sequencing revealed no nucleotide differences within the region that spanned approximately 3.47 Mb of the genome sequence. This genome matched the one identified in the cluster-related isolates.

An investigation headed by the General Directorate of Health showed that *L. pneumophila* ST1905–associated disease occurred in people who lived or stayed in Vila Franca de Xira between October 14, when the cluster began, and November 21, when it was considered to be controlled. Patient 2 had remained in Porto during these months, and to the best of our knowledge, she was the only person infected with *L. pneumophila* ST1905 who was not geographically linked to the cluster epicenter. Later investigation revealed that Patient 2 had never been to Vila Franca de Xira, and during the cluster period,

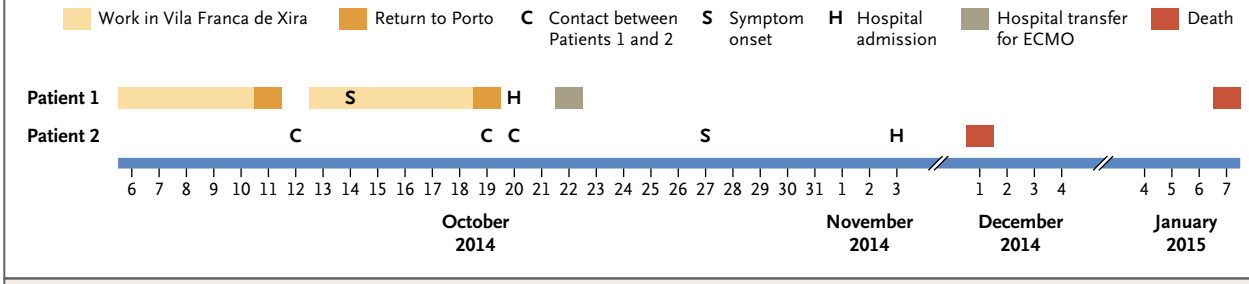

Figure 1. Timeline of Probable Transmission of Legionnaires' Disease from Patient 1 to Patient 2.
ECMO denotes extracorporeal membrane oxygenation.

no additional cases of Legionnaires' disease occurred in Porto.

Patients 1 and 2 lived alone in Porto, and their house consisted of small nonventilated rooms without air-conditioning units or room humidifiers. Collected water samples from the bathroom and the kitchen and a swab of the shower drain were negative for legionella. Patient 1 did not take water from Vila Franca de Xira to Porto.

We suspect that person-to-person transmission probably occurred when Patient 2 cared for her severely ill son. Factors that suggest person-to-person transmission are the severity of the respiratory symptoms in Patient 1, the very close contact that occurred during the 8 consecutive hours when Patient 2 took care of Patient 1, and the small area of the nonventilated room where this contact took place. In addition, the timeline of the events was highly coherent (i.e., the symptoms in Patient 2 developed 1 week after the close contact with Patient 1; this is consistent with the typical incubation period of Legionnaires' disease — a median of 6 to 7 days).[1]

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Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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