

## ELIMINATION OF LEGIONELLA IN A HOSPITAL WARD

### Organisations involved

National Institute of Public Health / National Institute of Hygiene (Narodowy Instytut Zdrowia Publicznego - Państwowy Zakład Higieny)

**Picture 1.** National Institute of Public Health / National Institute of Hygiene, Warsaw



### 1. Description of the case

#### 1.2. Introduction

Poland joined the European Working Group for Legionella Infections (EWGLI) in 1997. In 2002 reporting of legionellosis became mandatory. In 2006 there were 89 reported cases of legionellosis. These were community-acquired cases; no reports were received of hospital-acquired *Legionella* disease until the end of December 2006. Due to the lack of epidemiological studies, *Legionella* awareness in hospitals was low. There was no legal obligation to carry out specific sampling to assess the presence of *Legionella* in public buildings. *Legionella* infections were not considered an important issue in general wards. It was thought to be only a problem of specific wards that provide care for patients with reduced immune responses, such as intensive care units, neonatal or nephrology wards.

The first alarming sign of a hospital-acquired *Legionella* pneumonia (HALP) outbreak in Poland was detected in a huge, ten-floor regional hospital. Two patients in the intensive care unit were diagnosed with pneumonia due to *Legionella* infection. These patients had previously been treated in the hospital's ophthalmology unit. This 'coincidence' raised the concerns of the hospital's epidemiologists. Thorough examination of medical files revealed the antecedent event of two sudden pneumonia deaths in the ophthalmology ward in December 2006. The patients were admitted for eye disease, and after ten days in the hospital, pneumonia developed. It was suspected that *Legionella* caused these pneumonias. After retrospective analysis it was found that those patients should have been recognised as belonging to a high-risk group with respect to legionellosis. Some medical procedures used in ophthalmologic and laryngological wards require immunosuppressive treatment, in this case with steroids.

### 1.3. Aims

The first aim was to confirm or exclude the causative role of *Legionella* in these diseases. There are also legislative obligations that have to be fulfilled if a suspected outbreak occurs. After the confirmation of *Legionella pneumophila* as an aetiological agent of pneumonia, it was necessary to identify *Legionella* sources and eliminate the risk to patients and staff members, thus preventing any subsequent hospital-acquired *Legionella* infection.

### 1.4. What was done, and how?

The hospital reported the four suspected legionellosis cases to the local public health authority. Biological samples from the patients were sent to the National Institute of Public Health/ National Institute of Hygiene (NIPH-NIH) Bacteriology Department to test for *Legionella*. Meanwhile, the Municipal Hygiene Department of the NIPH-NIH analysed water samples taken from the ward's hot water system. The test results (specific *Legionella* antigens in urine, specific serum antibodies, polymerase chain reaction test, and microbial culture) confirmed Legionnaires' disease in four patients, which in three cases resulted in death.

Due to this epidemic of unknown origin the hospital reassessed its facilities and assessed the microbiological hygiene of the wards. During the standard inspections no discrepancies that would be able to cause these infections were traced. Nevertheless, water samples taken previously from the vicinity of the hot water tank were positive for *Legionella* in the range of 1,000–10,000 colony forming units per litre (CFU/l). The result was considered as proof of a high infection risk source within the hospital that could reasonably explain the outbreak. Based on the findings, the use of water for showers was prohibited, patient admission was limited and the hospital decided to eliminate all risks from *Legionella*. The hospital assessed the infection risk among the healthcare workers by collecting serums for *Legionella*-specific antibody screening. Staff members from the ophthalmology ward and intensive care unit, and plumbing maintenance workers participated in the test. Two employees, one from the ophthalmology ward and one from the intensive care unit, had positive IgM serum level

values. They had a history of previous flu-like symptoms, which might have been Pontiac disease: a benign reaction caused by *Legionella*.

When the diagnoses of Legionnaires' diseases were confirmed, the hospital started a programme to eliminate all possible bacterial sources. In the first phase showerheads were mechanically cleaned and heat-shocks were carried out to the hot water system. During the heat-shock treatment outflow water temperatures were checked at the showerheads. The hospital involved the NIPH-NIH in the elimination process. The experts of the institute assisted the hospital from the second phase of the elimination activities. The prompt, integrated, intense intervention consisted of mechanical cleaning, together with thermal and chemical disinfection of the hospital hot water system. After the treatment, new water samples showed a tenfold decrease in *Legionella* levels (0–480 CFU/l). This meant a diminished infection risk but highlighted the unexpected problems in the disinfection process. The third phase of the cleaning procedure was heat treatment followed by chemical disinfection. This phase was repeated after a month. These interventions almost eradicated *Legionella* but there were still traces of bacteria left within the system. This pointed to a deeper cause of *Legionella* colonisation. *Legionella* was only fully eliminated after some engineering interventions including the modification of the hot water system by cutting off the 'dead legs' of the system (areas where water is not exchanged when the system is flushed out, so that it can become stagnant) and by replacing both old hot water tanks with new, smaller ones. Metal tanks were replaced by plastic ones. The volume of the hot water tanks was decreased from 2x4,000 litres to 2x300 litres. Following these measures no *Legionella* was detected in the samples taken from the hospital's hot water system.

After this intervention, the hospital implemented an active programme for reducing the risks of legionellosis. Regular monitoring of hot and cold water temperature was prescribed. The hospital installed two pumps (one for each hot water system) dosing the disinfectant chloramine into the pipes. All water samples have been negative for *Legionella* bacteria since these measures were taken, and no new cases of Legionnaires' disease have been reported.

### **1.5. What was achieved?**

- *Legionella* was successfully eradicated from the hot water system.
- The Legionnaires' disease epidemic was halted; no new hospital-acquired infections have been reported.
- The case enhanced the implementation of the previously prepared guideline for the prevention of *Legionella* infection and reducing risks in hospital settings.
- The case encouraged new legislative measures. The Ministry of Health published new regulations for obligatory examination of drinking water in houses of multiple occupancy and healthcare facilities, especially hospitals. Limit values were set for *Legionella* spp. in water samples.

### **1.6. Success factors**

Close collaboration between the specialists of the hospital and the national authorities resulted in fast and effective measures. This cooperation helped to eradicate the problem and control the source of the infections, thus helping the hospital to achieve durable results.

### **1.7. Further information**

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### **1.8. Transferability**

The most important feature of this intervention was the good cooperation of experts from the hospital and the national authorities. This can serve as an example for all institutions, in Poland and abroad, that face similar problems.

### **1.9. Abstract**

The first hospital-acquired *Legionella* pneumonia in Poland was detected in the ophthalmology ward of a large hospital. Analysis of medical files revealed previous suspected pneumonia cases in the ophthalmology ward. Biological samples confirmed *Legionella* disease. The source proved to be the old hot water system. Chemical and heat-shock treatment of the pipelines diminished the bacterial load but further technical interventions were necessary to eliminate all bacteria. The engineers removed dead legs from the pipelines, as well as the large old metal hot water tanks. The hospital installed an automatic chemical disinfection system. *Legionella* disappeared and no new cases were observed.

## References, resources:

- Hanna Stypułkowska-Misiurewicz, Katarzyna Pancer, Bożena Krogulska, Renata Matuszewska: Ognisko Choroby Legionistów Na Oddziale Okulistycznym. Szpitalne Zakażenie Legionella Pneumophila Po Raz Pierwszy Obserwowane W Polsce. Przegl Epidemiol 2007; 61: 657 – 665  
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