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A cluster of Legionnaires' disease linked to an industrial plant in southeast Norway, June-July 2008

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During June and July 2008, five cases of Legionnaires' disease (LD) were reported to the local health authorities and the Norwegian Institute of Public Health (NIPH). The patients all lived in the industrial twin cities Sarpsborg and Fredrikstad in southeast Norway. In the same area, a large outbreak of LD with 56 cases and 10 deaths had occurred in 2005. The source at the time had been traced to an industrial air scrubber at the factory of one of the world's leading suppliers of wood-based chemicals (company A). During this outbreak patients were infected up to 10km away from the source [1].

Outbreak investigation

The five patients in this cluster had a median age of 81 years (range 51-84). They were four males and one female. Their dates of onset of illness were between 12 June and 11 July. Two patients died; both were over 80 years-old and had severe underlying disease. None of the patients had stayed overnight outside the Fredrikstad and Sarpsborg area in the period ten days prior to onset of disease (incubation period). No obvious indoor common source was identified (such as whirlpool, restaurant, air humidifier etc). With only five patients and their dates of illness onset spanning one month, information about the patients' movements as well as meteorological data during the probable incubation period provided only limited clues to identify a possible outdoor common source. However, four of the five patients had been in the vicinity of the production plant of company A, at distances varying from 300 m to 3 km.

The environmental investigations performed at 16 companies with cooling towers and/or air scrubbers in the area revealed that routine cleaning and disinfection procedures were done according to the current legislations. Samples taken from a total of 19 cooling towers and 13 air scrubbers between 24 June and 16 July were analysed for *Legionella*, either by PCR or culture according to standard procedure, as well as for total bacterial count.

Laboratory results

Legionella pneumophila serogroup 1 was cultured from three of the patients. *Legionella* was identified in samples from four of the 16 companies (companies A-D) and *L. pneumophila* serogroup 1 could be cultured from samples of company A and company B. Samples from company C and company D were PCR-positive for *Legionella* sp., but it was not possible to isolate *Legionella* by culture.

Patient isolates and environmental samples were genotyped using sequence-based typing as previously described [2] and recommended by the European Working Group for *Legionella* Infections (EWGLI). The results showed the same sequence type (ST) of *L. pneumophila* serogroup 1 in samples from three patients and five routine samples taken on 24 and 25 June at company A. All these isolates were ST462. This genotype has been registered only once before in the EWGLI database which comprises, as of 17 September 2008, a total of 543 STs representing the genotypes of 2,023 *L. pneumophila* isolates.

The isolate from company B was identified as ST392.

Public health measures

Together with the municipality and with advice from NIPH, company A performed a thorough assessment of the cleaning and disinfection routines between autumn 2005 and the time of identification of the positive samples in June 2008. One of the *Legionella*-positive samples taken in June 2008 was from the industrial air scrubber that was identified as the source in the outbreak in 2005 [1]. This air scrubber was consequently shut down in early July 2008. Two other positive samples came from another air scrubber and a further two were from the aeration ponds of the biological treatment plant. In these aeration ponds *L. pneumophila* serogroup 1 was found in high concentrations (approximately 10^{10} cfu/L).

The purpose of these aeration ponds is degradation of organic material by means of microbiological decomposition. The temperature is around 37°C and 30,000 L air per hour are pumped into the ponds to provide optimal conditions for microbiological activity. It is known from previous investigations that the conditions in such ponds are favourable for the growth of *Legionella* [3-5].

Samples taken by company A from the recipient river Glomma in August 2008 showed high concentrations of *L. pneumophila* serogroup 1 at the outlet of the production plant and more than 10 km downstream. No *Legionella* could be cultured from samples taken upstream the outlet.

Based on the results of the outbreak investigation [6] and as a precautionary measure, the aeration ponds of the biological treatment plant at company A have been temporarily shut down and will not be restarted until further notice. This will increase the amount of organic content in the waste water released into the river Glomma, and permission for this has been obtained from the Norwegian Pollution Control Authority.

Discussion

The investigation concluded that there was a link between three of the five patients and the detection of *Legionella* at company A. However, it is at present not clear how the bacteria have spread from the production plant to the patients. The aeration ponds of the biological treatment plant most likely played an important role in the growth and spread of bacteria, either directly through the air or indirectly by contaminating the air scrubbers or the river.

Following the 2005 outbreak, new regulations were implemented in Norway to minimise the risk of spread of *Legionella* bacteria from aerosol-generating equipment. This legislation emphasises the owners' and operators' responsibility to inspect, maintain and monitor aerosol-generating equipment that has conditions suitable for the growth of *Legionella*.

Investigation of the present cluster did not reveal any breach of the regulations. Company A practised frequent maintenance and monitoring procedures of the air scrubbers. However, following this new outbreak of Legionnaires' disease linked to the same industrial plant as the large outbreak in 2005 [1], the Norwegian health authorities consider revising the present guidelines and regulations.

The outbreak investigation recognises that more studies and research are needed to increase the knowledge about the role of biological treatment plants and their potential for spread of *Legionella* to the environment. There is also a need for assessing whether the environmental conditions in treatment plants in the pulp and paper industry are especially favourable for the growth of *Legionella* bacteria.

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References

1. Nygård K, Werner-Johansen Ø, Rønsen S, Caugant DA, Simonsen Ø, Kanestrøm A, et al. An outbreak of legionnaires disease caused by long-distance spread from an industrial air scrubber in Sarpsborg, Norway. Clin. Infect. Dis. 2008;46(1):61-9.
2. Gaia V, Fry NK, Afshar B, Lück PC, Meugnier H, Etienne J, et al. Consensus sequence-based scheme for epidemiological typing of clinical and environmental isolates of Legionella pneumophila. J. Clin. Microbiol. 2005;43(5):2047-52.
3. Allestam G, Långmark J. Legionella in biological clarification plants. Mapping and risk assessment 2005-2007. [In Swedish]. Stockholm: Smittskyddsinstitutet; 2007. Rapportserie. 3:2007.
4. Blatny JM, Skogan G, Reif BAP, Andreassen Ø, Caugant DA, Høiby EA,et al. Detection of Legionella spp. in the air around Borregaard. Kjeller: Forsvarets forskningsinstitutt; 2007. FFI-rapport 2007/00560.
5. Blatny J, Reif BA, Skogan G, Andreassen Ø, Høiby EA, Ask E, et al. Tracking airborne Legionella and Legionella pneumophila at a biological treatment plant. Environ. Sci. Technol. 2008; DOI: 10.1021/es800306m.
6. Outbreak of legionnaires' disease in Østfold June – July 2008. [In Norwegian]. Oslo: Folkehelseinstituttet; 2008. Available from: http://www.fhi.no/dav/ce069fc583.pdf

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