A Cluster of Legionella-Associated Pneumonia Cases in a Population of Military Recruits

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A Legionella cluster was identified through retrospective PCR analysis of 240 throat swab samples from X-ray-confirmed pneumonia cases. These were identified among young and otherwise healthy U.S. military recruits during population-based surveillance for pneumonia pathogens. Results were confirmed by sequence analysis. Cases clustered tightly, suggesting a local environmental etiology.

CASE REPORT

Legionella pneumophila was identified by PCR in the oropharyngeal swabs of five male recruits aged 18 to 28 years who were diagnosed with, and treated for, X-ray-confirmed pneumonia at the Marine Corps Recruit Depot, San Diego, CA (MCRD). All five recruits were housed together in the same barracks as part of three platoons of the same training company, and initially all reported ill with pneumonia between 3 November and 8 November 2004. Positive samples were collected on the 3rd, 5th, and 8th of November, along with five concurrent but otherwise identical negative samples taken from recruits with pneumonia from other companies at MCRD with use of the same batch of sampling reagents. Identical reagents were also used to collect 24 more nonconcurrent negative samples from pneumonia patients at the same site. During the week in which the positive samples were collected there were nine active companies at the training center. Clustering of all five cases in one company was highly significant (P = 0.001, Fisher’s exact test, weighted for company size). There was no significant clustering in platoons. Testing extended to 240 samples collected during the years 2004 and 2005, all collected by the same methods and all stored and processed together, and the cluster appeared to be tightly limited in time. No other samples were identified as L. pneumophila positive.

Prior to recruitment, one of the five recruits was a regular smoker, one was a light smoker, and three had never smoked. None of the five reported a history of chronic cough, cough at night, asthma, or shortness of breath. One of the five reported a history of hay fever; the others reported no such history. All five reported to basic training on the same day from different training facilities as part of ongoing pneumonia surveillance of recruits. Throat swabs were taken when the patients initially reported with pneumonia symptoms, and upon positive chest X-ray, patients were enrolled in the Naval Health Research Center’s population-based pneumonia surveillance study. Oropharyngeal swabs (sterile polyester-tipped applicators; Puritan, Guilford, ME) were placed in 1 ml TE buffer (0.01 M Tris, 0.001 M EDTA [both from Sigma, St. Louis, MO] in diethyl pyrocarbonate-treated molecular-biology-grade water [Quality Biologicals]) and transported on dry ice to the testing facility, where the samples were stored at −80°C.

Retrospective identifications were made using a newly developed multiplex PCR test for the atypical pneumonia pathogens L. pneumophila, Mycoplasma pneumoniae, Chlamydophila pneumoniae, and Bordetella pertussis (8). This test was applied retrospectively to 240 samples collected at four military recruit training facilities as part of ongoing pneumonia surveillance of recruits. Two-hundred-microliter sample aliquots were extracted for PCR using the Qiagen blood kit (Qiagen, Valencia, CA) following the manufacturer’s instructions. Five microliters of the resulting 200-µl extracts was used for PCR. Negative controls included a blank swab in TE buffer, and all controls yielded negative results. L. pneumophila-positive results were confirmed by replication of initial PCR and sequencing (in both directions) of the band-purified amplicons using an ABI 3130 capillary sequencer and BigDye reagents (both from Applied Biosystems, Foster City, CA) per the manufacturer’s instructions. All sequences were identical (MCRD consensus, Fig. 1), and all were an exact match to L. pneumophila.
Given the distribution of recruits at the training center during the time of the cluster, it is statistically unlikely that these would be clustered in the same company by chance. This suggests a common source in the recruits’ shared environment, probably a shared training facility outside the barracks. *Legionella pneumophila* is known to cause building-specific outbreaks (5), and infection by person-to-person contact has not been reported in the literature (12). Exposure to *Legionella* comes from environmental sources, such as fresh water and water systems for heating and cooling (12).

*L. pneumophila*-associated pneumonia is not generally thought to affect young adults, but rather the elderly, the immunocompromised, or those with underlying respiratory ailments (3). Cases affecting generally healthy young adults have rarely been reported, and those cases appear to have been isolated (6, 13). Given the age and general health of the recruits, identification of this cluster may suggest a previously unrecognized suscep-
sibility of military recruit populations. Recruits in training are known to be highly susceptible to a variety of respiratory diseases.

The fact that four out of five of the patients also harbored adenovirus suggests that the very high rate and continuous occurrence of adenovirus-associated febrile respiratory illness in this population (2) may act as a predisposing factor for L. pneumophila colonization. It is impossible to say whether the L. pneumophila identified in these patients was the primary factor in their pneumonias, as adenovirus is strongly associated with pneumonia in recruit populations. We do not claim to demonstrate a causal link but feel that it is important to note the observed association in order to encourage continued surveillance for this potentially severe pathogen in recruits reporting with pneumonia. If similar future severe cases were recognized more quickly, greater efforts could be made to identify environmental sources, to utilize the proper serological and culture measures for legionellosis case definition, and to better define the impact of this pathogen on the affected recruits’ health.

Unique medical factors related to recruit respiratory health include crowding, stress, sleep deprivation, a large number of people brought together from different geographic environments, prophylactic antibiotic treatment, and multiple vaccinations, the last two of which are specifically directed at preventing the spread of respiratory disease and pneumonia in this highly susceptible population.

The 240 tested pneumonia samples were collected between September 2004 and November 2005. No samples other than those discussed were positive for Legionella. Given the tightness of the temporal clustering of the Legionella-positive samples, the cluster appears to have been self-limiting. Such incidents may be sporadic and thereby undetectable in the absence of active, ongoing surveillance.

(Portions of the work presented here have been previously presented at the Force Health Protection Conference [2006], the Navy Environmental Health Center Conference [2006], and the International Conference on Emerging Infectious Diseases [2006].)

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REFERENCES

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