Comparative Study of Legionella pneumophila and Other Nosocomial-Acquired Pneumonias*

Jorge Roig, M.D.; Xavier Aguilar, M.D.; Juan Ruiz, M.D.; Christian Domingo, M.D.; Eduardo Mesalles, M.D.; José Manterola, M.D.; and José Morera, M.D.

We studied, in a prospective way, the characteristics of definitively diagnosed nosocomially acquired pneumonias in our hospital over 36 months. Out of 55 cases, 27 were due to Legionella pneumophila and 28 to other, non-Legionella bacteria. The cases of legionellosis concentrated in July, August, and December. The only risk factors that showed significant differences (p<0.05) were general anesthesia and surgery and immunosuppressive disease, which were more frequent in the non-Legionella group, as were chronic liver disease and lowering of consciousness level. The absence of severe underlying disease, chronic or not, was uncommon in both groups, but more frequent in the Legionella group. We observed no differences in the clinical features of the two groups. Mean values of gamma-glutamyltranspeptidase and total bilirubin were higher (p<0.05) in the non-Legionella group. The only x-ray data that showed significant difference were pleural effusion, more frequent in the non-Legionella group (p<0.02). The mortality rate of legionellosis was 14.6 percent compared to 35.7 percent for the non-Legionella group (p<0.05). We conclude that a sure differential diagnosis based on clinical, roentgenographic and analytical features of both groups is not possible. The relatively low mortality rate of the Legionella group, when compared to other series of nosocomial legionellosis, could be due to the standard use of erythromycin in the therapeutic approach to nosocomially acquired pneumonia in our hospital. (Chest 1991; 99:344-50)

Since its first isolation in 1977, the importance of Legionella pneumophila as a causative agent of both community and hospital-acquired pneumonias has increased continually. Its role as a possible, and sometimes unexpected, etiologic agent of nosocomial-acquired pneumonia has been well established for more than a decade. Moreover, the knowledge of the variability and severity of involvement of various organs has been expanding to the present date.

The problem of differentiating Legionella pneumophila from other types of non-Legionella pneumonias has been a matter of controversy. Some references have focused on the comparison between community-acquired pneumonia due to Legionella and that due to other bacteria. To our knowledge, the setting of nosocomial pneumonia has not been approached, from this point of view, to a similar extent. There are just a few references in the English literature. Some of them consider together cases of hospital-acquired as well as community-acquired Legionella pneumonia, and others report various species other than L. pneumophila, most frequently L. micdadei. With the purpose of contributing to the evaluation of this subject, and taking into account the existence of previous endemic nosocomial legionellosis in our hospital, we decided to undertake a prospective study comparing the characteristics of non-Legionella pneumonia and Legionella pneumonia, both acquired in our medical center.

MATERIAL AND METHODS

Fifty-five patients with a definite diagnosis of nosocomially acquired pneumonia were identified in a prospective study performed in our hospital over 36 months, from August 1985 to September 1988. The hospital had been inaugurated 2½ years before. The number of beds increased slowly from 294 at the beginning of the study to 419 at the end. The level of bed occupation approached 80 percent. No organ transplant had been performed in our hospital until the year 1985, when just a few kidney transplants began to take place.

To accept a patient with proven pneumonia for this study, at least one of the following three criteria was required: (1) patients that had been admitted to the hospital at least 48 hours prior to the time of onset of pneumonia; (2) patients that had been discharged from the hospital within eight days of the onset of symptoms or signs of pneumonia; and (3) outpatients or visitors of hospitalized patients that, for whatever reason, had remained in the hospital for many hours a day, and at least 48 hours prior to the onset of illness.

Out of the 55 cases of nosocomial pneumonia, 27 were due to L. pneumophila and 28 to other, non-Legionella bacteria. To include a patient in the Legionella pneumonia group, at least one of the following three criteria was required: (1) a positive Legionella culture from respiratory secretions. The specimens were inoculated in a selective buffered charcoal yeast extract medium. The specific

---

*From the Servei de Pneumologia, Servei de Cures Intensives, Servei de Microbiologia, Hospital Germans Trias i Pujol, Badalona (Barcelona), Spain. Manuscript received May 16; revision accepted July 26. Reprint requests: Dr. Roig, Hospital Germans Trias i Pujol, Badalona (Barcelona), Spain 08916

NLP = non-Legionella pneumonia; LP = Legionella pneumonia; DFA = direct fluorescent antibody staining; IFA = immunofluorescent antibody test; PTC = plugged telescopical catheter
The performed antibody ingredients were enough lumen specimens in to were the and agent grade, from quantitative pleural center for pneumonia. Taking samples that could be confirmed, a positive blood, pleural fluid or pulmonary aspiration culture. Samples obtained for culture were processed according to standard methods. A quantitative culture greater than 10^6 colony-forming units per ml from samples obtained by PTC brush. We specifically rejected both transtracheal aspirates and sputum cultures, whatever their Murray's grade, when deciding to include a patient in this non-Legionella group. By means of this strict bacteriologic confirmation of the diagnosis, 28 cases of non-Legionella pneumonia were included in the control group to be compared with the 27 pneumonia cases due to L. pneumophila. Other possible non-Legionella bacteria cases that could not be confirmed by isolation of a determined etiologic agent from a non-contaminated sample were excluded from this series since the present study hinges upon rigorous diagnostic criteria.

The decision of whether or not an invasive diagnostic procedure was to be performed was based on the following two factors: (1) The underlying general condition, and especially the cardiopulmonary state, of the patient, which often ruled out transthoracic lung puncture or even bronchoscopy because of unacceptable morbidity; and (2) The immediate availability of a pneumologist and a microbiologist to perform a determined invasive procedure and process the sample quickly and properly.

Risk factors and clinical, roentgenographic, and analytic data were evaluated by the authors according to a preestablished protocol. All these measurements were obtained during the first 24 to 48 hours of illness. X-ray films were evaluated by two observers, and in addition to posteroanterior views, lateral views were available in most cases. Urinary abnormalities were excluded from analytic evaluation because the frequent presence of a bladder catheter at the moment of diagnosis of pneumonia could have produced misleading results.

Statistical evaluation was performed with Student's t-test and chi-square analysis, with Yates's correction for small numbers.

**RESULTS**

During a period of 36 months, we diagnosed 55 cases of nosocomial pneumonia. Of these 55 cases, 27 were due to L. pneumophila serogroup 1 and 28 were due to other types of bacteria. The breakdown of this second group of cases was the following:

- **Gram-negative bacilli** ................. 17
- **Staphylococcus aureus** ............... 6
- **Streptococcus pneumoniae** ........... 5
- **Miscellaneous** ......................... 5
- **Mixed infection** ....................... 4

Most of the Gram-negative bacilli were *Pseudomonas aeruginosa*. The miscellaneous group was formed by *Streptococcus viridans* and anaerobic bacteria (two cases each) and *Streptococcus faecalis* (one case). Three patients showed double infection. Three different bacteria were isolated in a fourth patient.

According to the criteria previously specified, 27 cases of Legionella pneumonia were diagnosed. In 16 cases a positive Legionella culture was the method of diagnosis. Of these 16 positive cultures, three were obtained from sputum, 13 from bronchoaspirate or bronchoalveolar lavage samples, and three from transthoracic lung aspirates. In three patients, both sputum and bronchoalveolar lavage samples, obtained by fiberbronchoscopy, were positive. The DFA test was performed in a minority of patients and there was only one case in the Legionella group in which the diagnosis was obtained by a clearly positive DFA test from a bronchial sample without subsequent confirmation by culture or serology. In ten patients, serology was the only method of diagnosis.

Five of 27 Legionella cases and two of 28 non-Legionella cases were patients that had been discharged from the hospital a few days before the onset of pneumonia. Two patients of the Legionnaires' disease group and none of the non-Legionella pneumonia group were visitors that spent many hours a day in the hospital during the days prior to the onset of illness. None of these differences showed statistical significance.

The age distribution of both groups of pneumonia is shown in Figure 1. There was a predominance in

**Age Distribution**

![Age Distribution Chart](chart.png)

**Figure 1.** Age distribution of patients with hospital-acquired *Legionella pneumophila* pneumonia (LP) and other, non-Legionella pneumonias (NLP).
both groups of the 50- to 80-year-old age bracket; however, both types of hospital-acquired pneumonia were found at all ages. The mean age of the Legionnaires' disease group was 65 and that of the non-Legionella group was 58 (p<0.05). The male-female ratio was 18:9 for the Legionnaires' disease group (2:1) and 25:3 for the non-Legionella pneumonia group (8:1) (p<0.02).

We were interested in finding out if there was a seasonal pattern of distribution to these groups, so we looked at the monthly distribution (Fig 2). The higher incidence of Legionnaires' disease cases in the months of July, August, and December was statistically significant when compared with the incidence reported in other months (p<0.05). This seasonal pattern was not found in the non-Legionella group.

The only risk factors that showed significant differences (Table 1) were general anesthesia and surgery and immunosuppressive disease (p<0.05). Chronic liver disease and the presence of lowering of the consciousness level, prior to the diagnosis of pneumonia, were also more frequent in the non-Legionella group. The five immunosuppressive disease cases found in the Legionnaires' disease group were the following: kidney transplant (three); lung cancer under cytostatic therapy (one); and hematologic malignancy (one). The 13 cases of immunosuppressed condition that were found in the non-Legionella pneumonia group were the following: lung cancer or other solid malignancies under cytostatic therapy (five cases); hematologic malignancies (three); systemic disease under high-dosage corticosteroid therapy (two); and miscellaneous diseases under long-term corticosteroid therapy (three). Other risk factors that showed no statistical difference between both groups were the following: prior antibiotic treatment, fibrobronchoscopy, gastroduodenoscopy, tracheostomy, smoking, alcoholism, chronic obstructive pulmonary disease, diabetes mellitus, chronic heart disease, chronic renal failure, the use of nebulization equipment, and mechanical ventilation. Six out of 27 Legionnaires' disease cases and two out of 28 non-Legionella pneumonia cases lacked any severe underlying disease, that is, they did not show any of the pathologic conditions that we have included in the previous list of analyzed risk factors.

Clinical Features

We considered the presence of chest pain, cough, hemoptysis, the absence of respiratory symptoms, the lack of localizing signs in chest examination, the presence of fever >38°C, chills, abdominal pain, diarrhea, changes in mental state, and headache. None of these parameters showed a statistically significant difference between the two groups (Table 2). Fever was the most constant clinical feature in both types of pneumonia. We want to emphasize the high percentage of patients (40 to 50 percent), in both groups, who did not show any respiratory symptoms or specific signs on chest examination.

Table 1—Risk Factors in Patients with Hospital-Acquired Legionella pneumophila Pneumonia (LP) and Other, Non-Legionella Pneumonias (NLP)

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LP (27)</td>
</tr>
<tr>
<td>General anesthesia</td>
<td>5</td>
</tr>
<tr>
<td>Surgery</td>
<td>5</td>
</tr>
<tr>
<td>Immunosuppressive disease</td>
<td>5</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>0</td>
</tr>
<tr>
<td>Lowering of consciousness level</td>
<td>0</td>
</tr>
</tbody>
</table>

*p<0.05.

Table 2—Presenting Clinical Features in Patients with Hospital-Acquired Legionella pneumophila Pneumonia (LP) and Other, Non-Legionella Pneumonias (NLP)

<table>
<thead>
<tr>
<th>Clinical Features</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LP (27)</td>
</tr>
<tr>
<td>Chest pain</td>
<td>5</td>
</tr>
<tr>
<td>Cough</td>
<td>11 (40.7)</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>2 (7.4)</td>
</tr>
<tr>
<td>Absence of respiratory symptoms</td>
<td>12 (44.4)</td>
</tr>
<tr>
<td>Lack of localizing signs in chest</td>
<td>10 (37)</td>
</tr>
<tr>
<td>Fever &gt;38°C</td>
<td>24 (88.8)</td>
</tr>
<tr>
<td>Chills</td>
<td>4 (14.8)</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>0 ( - )</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>0 ( - )</td>
</tr>
<tr>
<td>Changes in mental state</td>
<td>0 ( - )</td>
</tr>
<tr>
<td>Headache</td>
<td>1 (3.7)</td>
</tr>
</tbody>
</table>
Table 3—Presenting Roentgenographic Features in Patients with Hospital-Acquired Legionella pneumophila Pneumonia (LP) and Other, Non-Legionella Pneumonias (NLP)

<table>
<thead>
<tr>
<th>Roentgenographic Features</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LP (27)</td>
</tr>
<tr>
<td>Extent of shadowing:</td>
<td></td>
</tr>
<tr>
<td>One lung</td>
<td>17</td>
</tr>
<tr>
<td>Both lungs</td>
<td>10</td>
</tr>
<tr>
<td>One lobe</td>
<td>15</td>
</tr>
<tr>
<td>Two or more lobes</td>
<td>12</td>
</tr>
<tr>
<td>Homogeneous consolidation</td>
<td>24</td>
</tr>
<tr>
<td>Cavitation</td>
<td>2</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>4</td>
</tr>
</tbody>
</table>

*p<0.02.

(Table 3): (1) extent of shadowing, involving one lung, both lungs, one lobe or two or more lobes; (2) homogeneous consolidation; (3) cavitation; and (4) pleural effusion. We looked specifically for the presence of blunting of the costophrenic angle which was considered as evidence of pleural effusion and was subsequently confirmed by thoracentesis in each case.

Unilateral and unilobar involvement was the most frequent initial roentgenographic finding in both groups. The only feature that showed a statistically significant difference was pleural effusion (p<0.02), which was much more common in the non-Legionella group. The two cases of cavitation in the Legionella group were detected in patients with severe immunosuppression.

Analytical Features

A summary of the more meaningful results from the comparison of the laboratory data of both groups is shown in Table 4. We found no significant differences between hematologic data of the two groups. Although the mean value of natremia was significantly higher in the non-Legionella group, the number of cases with natremia <130 mEq/L in both types of pneumonia did not show a statistically significant difference. The significantly higher values of liver function tests in the non-Legionella group could be related to the increased frequency of chronic liver disease as a risk factor for these patients, as specified above.

Treatment and Outcome

Since the discovery of the first cases of Legionella pneumonia in our hospital, erythromycin has been included in the initial therapeutic approach to nosocomial pneumonia. So, all patients belonging to the Legionella group were treated with 4 g/day of erythromycin from the moment of diagnosis of pneumonia. Patients of the non-Legionella group were treated according to culture and antibiogram results. Before the isolation of the causative bacteria was performed, patients of the non-Legionella group were treated with a combination of erythromycin, 4 g/day, and a third-generation cephalosporine, or sometimes, an aminoglycoside.

Out of the 27 Legionnaires’ disease patients, four died despite appropriate parenteral therapy. Ten of the 28 non-Legionella pneumonia patients also died. Progressive respiratory failure was the most common cause of death in both groups. The comparison between the mortality rate of the Legionella group (14.8 percent) and that of the non-Legionella group (35.7 percent) showed a statistically significant difference (p<0.05).

DISCUSSION

The aim of our study was to obtain clinically relevant conclusions from the comparison, in a prospective way, of the characteristics of hospital-acquired pneumonia due to L. pneumophila and other, non-Legionella bacteria. It has been suggested that community- and hospital-acquired legionellosis tend to be similar in many aspects. However, it seems logical to expect that the population admitted to a hospital usually has a compromising underlying condition that could modify clinical response to this infection and induce some significant discrepancies between the features of these two forms of Legionella pneumonia. That is why we have restricted this comparative study to the nosocomial setting.

Previous references to this subject show some drawbacks that we have tried to eliminate. Most published series are retrospective reviews and do not differentiate between nosocomial and community acquisition of the Legionnaires’ disease, so their results might not be as reliable as expected. Other references have focused on species of Legionella different from L. pneumophila, usually L. micdadei, also known as Pittsburgh pneumonia agent. It is stated that, in spite of some similarities between L. pneumophila and L. micdadei, there are also some

Table 4—Analytical Features in Patients with Hospital-Acquired Legionella pneumophila Pneumonia (LP) and Other, Non-Legionella Pneumonias (NLP)

<table>
<thead>
<tr>
<th>Laboratory Data</th>
<th>Mean Value ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LP (27)</td>
</tr>
<tr>
<td>Natremia</td>
<td>134.2 ± 6.2</td>
</tr>
<tr>
<td>Gamma-glutamyltransferase</td>
<td>50.2 ± 39.8</td>
</tr>
<tr>
<td>Total bilirubin</td>
<td>0.9 ± 1.2</td>
</tr>
<tr>
<td>Bilirubinemia &gt;1.2 mg/dl</td>
<td>5</td>
</tr>
<tr>
<td>Creatinine &gt;1.3 mg/dl</td>
<td>3</td>
</tr>
<tr>
<td>Arterial hypoxemia &lt;60 mm Hg</td>
<td>12</td>
</tr>
</tbody>
</table>

*p<0.05.
special characteristics of *L. micdadei*, such as its peculiar roentgenographic abnormalities²⁶-²⁸ and a greater tendency to subclinical manifestation.²⁹ So the conclusions obtained in this type of study can not be extended to the specific case of *L. pneumophila* infections.

In some series, the control, non-Legionella group is formed by nosocomial pneumonia cases diagnosed on the basis of cultures from samples obtained without avoiding contamination with the saprophyte oropharyngeal flora, such as sputum or tracheal aspirates.²⁵,²⁶ In our opinion and that of others,²⁶,²⁹ these diagnoses are not completely reliable, so we used the strictest criteria for inclusion of a case in our non-Legionella group.

We were also concerned about the unusual but well-referenced possibility of a false positive DFA Legionella test,³³,³⁵,³¹ especially that due to some Pseudomonas species.³² Therefore, we confirmed almost all our Legionella cases by positive culture or serology. Some series of legionellosis show significant percentages of their diagnoses based exclusively on the DFA test.¹⁰

We focused on the first two days of illness, due to the fact that, in the therapeutic approach to nosocomial pneumonia, it is known that an earlier diagnosis implies a better prognosis.³⁰ Those studies that do not concentrate on the early stage of the disease probably give information that is not so relevant.

The reported relative incidence of nosocomial legionellosis in hospital-acquired pneumonia is characterized by its variability.³³ A hallmark of many references is that Legionella can remain easily unsuspected or underdiagnosed until specific diagnostic methods are routinely used in the initial diagnostic approach to nosocomial pneumonia.⁴-¹³,²⁶ A common point to all hospital-acquired legionellosis series has been the discovery of contamination of the water supply system,⁴-¹³,²⁶,³⁴,³⁶ which was also observed in our hospital. Routine culturing of the water supply system was not performed, but *L. pneumophila* was frequently isolated at different locations. The irregular basis of our environmental cultures and the absence of molecular subtyping of linked patients and environmental isolates hampered our ability to draw conclusions on this particular point.

The clear predominance of Gram-negative bacilli in the non-Legionella group is in agreement with most published nosocomial pneumonia series.³³ The occurrence of mixed infections has also been well recognized.²⁹,³⁷

The importance of considering visitors and recently discharged patients as susceptible to nosocomial pneumonia has been especially stressed in the case of legionellosis, with a reported incidence as high as 45 percent in Kirby's series.⁴ In relation to this point, we have found no significant differences between Legionella pneumonia and non-Legionella pneumonia patients.

Whatever its causative agent, hospital-acquired pneumonia usually shows a predilection for patients of advanced age.³³,³⁷ Our series shows that this tendency was common to both groups. The real utility of mean age and sex differences between Legionella and non-Legionella pneumonia cases, despite their statistical significance, can probably be considered low from a practical point of view.

A seasonal pattern of distribution has been described in some outbreaks of nosocomial legionellosis.³³,³⁴,³⁶,³⁷ A preference for the summer months has generally been reported.³³ The water temperature during these months can be most favorable to the amplifying mechanisms of Legionella. A Legionella-favoring influence of certain algae, aquatic protozoa and plants such as *Myriophillum spicatum* (which tends to show a seasonal relationship with legionella), has been hypothesized.³³,³⁷ Our outbreaks in July and August suggested a correlation with the operation of the air conditioning system that would have acted as a disseminator of the infection, but we were at a loss to find such an explanation for the high incidence in December. At any rate, it seems that the presence of significant monthly differences in the incidence of nosocomial pneumonia could raise the suspicion of Legionella pneumonia and even support this etiology when approaching a differential diagnosis.

Specific problems sometimes found in an expanding, new hospital—such as medical and surgical patients, as well as different specialties, sharing the same ward, or frequent movement of patients due to the opening of new wards—have made impossible any reliable analysis of the influence of these factors in our study.

Hospital-acquired Legionnaires' disease is said to occur very infrequently in the absence of underlying disease,²,³³ but this statement can also be applied to other etiologies of hospital-acquired pneumonia.³³,³⁷ In fact, in our study, the lack of severe underlying disease was more frequent in Legionella pneumonia patients.

The high frequency with which conditions classically associated with aspiration appear as significant risk factors for the non-Legionella group (general anesthesia, surgery, lowering of consciousness level) supports the concept of aspiration of previously colonized oropharyngeal contents as the usual pathogenic way of acquiring nosocomial pneumonia due to non-Legionella bacteria.³³,³⁷ Some references have emphasized that direct aspiration or tracheal inoculation of Legionella-contaminated water could be a mode of transmission of Legionnaires' disease.⁷,¹¹-¹³,³⁴ However, colonization of the oropharynx by Legionella has not been demonstrated to the present date.³⁸-⁴⁰

Serious immunosuppressive disease occurred in
both groups but was more frequent in the non-Legionella group. In fact, immunocompromised hosts are known to be a most susceptible population to nosocomial pneumonia, either due to Legionella or to other bacteria. Other comparative studies have not found significant differences in the prevalence of any risk factors for Legionella vs non-Legionella pneumonia. Our relatively low incidence of severe underlying immunosuppression in the Legionella pneumonia group, when compared to other series of nosocomial legionellosis, can have influenced the mortality rate, as we discuss later. Chronic liver disease was more common in the non-Legionella group, and one can speculate, to suggest an explanation for this finding, on the possibility of subclinical encephalopathy favoring aspiration of oropharyngeal flora in non-Legionella pneumonia patients.

There was an evident overlap of the clinical features of pneumonia due to *L. pneumophila* and to other bacteria. Our results agree with those of two previous prospective, nosocomial studies. Clinical data that have been suggested as distinctive of legionellosis, such as diarrhea or neurologic symptoms, are not helpful in the nosocomial setting. As is known, fever is the most constant clinical feature. The high incidence (40 to 50 percent) of patients in both groups who did not complain of any respiratory symptoms and who did not show rales or other consolidation signs on chest examination has to be emphasized when considering the first 24 to 48 hours of disease. More distinctive symptoms and signs of pneumonia appear later in the course of the illness with progressive frequency. The appearance of fever >38°C in a hospitalized patient, without any other obvious cause, should raise a high index of suspicion of pneumonia.

The early evaluation of chest x-ray abnormalities showed a predominance of unilateral and unilobar involvement that was common to both groups of pneumonia. This presenting roentgenographic feature has usually been reported in most legionellosis series. However, it is worthwhile to emphasize that, even in such an early stage, 10 out of 27 Legionella pneumonia patients and 9 out of 28 non-Legionella pneumonia patients showed initial bilateral lung involvement. Cavitation has been stressed as more frequent in legionellosis when involving seriously immunocompromised hosts. In fact, our two cases of cavitation were found in patients with severe immunosuppressive disease. Pleural effusion was significantly more frequent in the non-Legionella group. Although pleural effusion has been reported to be relatively common in legionellosis, usually it is not a presenting roentgenographic feature. So, it seems that the finding of pleural effusion on the initial chest x-ray could be a quite valuable roentgenographic clue in the initial differential diagnostic approach to hospital-acquired pneumonia.

Laboratory data in nosocomial legionellosis are generally considered as nonspecific. Yu et al suggested that hyponatremia <130 mEq/L during the first days of illness could be a helpful analytic feature to support the diagnosis of legionellosis. In spite of a tendency toward lower mean natrema values in our Legionella pneumonia patients, the number of cases that showed natrema <130 mEq/L did not show a significant difference when compared to the non-Legionella group. The association of underlying chronic liver disease as a more common risk factor for the non-Legionella group with the higher incidence of abnormal hepatic tests in these patients seems to be evident. The finding of severe hypoxemia in almost 50 percent of the patients in both groups is in agreement with respiratory failure as being the usual cause of death in both Legionella and non-Legionella pneumonia patients.

The striking difference in mortality between the two groups, 14.8 percent in legionellosis patients vs 35.7 percent in non-Legionella patients, can be attributed to the high efficacy of the treatment with 4 g/day of erythromycin against legionellosis. The mortality rate of most series of nosocomial legionellosis ranges from 25 to 70 percent. Two factors can justify, at least in part, this reported variability in the case-fatality rate: first, the percentage of immunocompromised patients and the degree of severity of their underlying disease at the moment of diagnosis of legionellosis. In our series, the number of immunocompromised hosts is lower than that reported in many references that have a higher mortality rate than ours; and second, whether or not an effective antibiotic treatment is administered. An inappropriate antibiotic therapy, in Legionella pneumonia cases, usually implies a high mortality rate. Moreover, a delay in the proper treatment also implies a worse outcome. Erythromycin remains the drug of choice for the treatment of legionellosis, both hospital-acquired and community-acquired.

We conclude that, due to the overlap of clinical, roentgenographic, and analytic features between nosocomial pneumonia due to *L. pneumophila* and that due to other bacteria, it is advisable to include routine, specific diagnostic methods for Legionella in the initial diagnostic approach to hospital-acquired pneumonia. If nosocomial legionellosis, sometimes unexpectedly, is discovered, the outcome can be improved by including erythromycin in the initial therapeutic approach to nosocomial pneumonia, until the efficacy of Legionella eradicates measures is finally proven.

REFERENCES

1. McDade JE, Shepard CC, Fraser DW, Tsai TR, Redus MA, Dowdle WR. Legionnaires' disease: isolation of a bacterium. 

CHEST 90 / 2 / FEBRUARY, 1991 349
Comparative Study of Nosocomial-Acquired Pneumonias (Roig et al)


2 Bartlett CLR, MacRae Ad, MacFarlane JT. Legionella infections. 1st ed. London: Edward Arnold Publisher, 1986; 37-55


21 Jones GL, Hebert GA. Legionnaires: the disease, the bacterium and methodology. 1st ed. Atlanta: Center for Disease Control, 1979


41 Fairbank JT, Mamourian AC, Dietrich PA, Gyrold JC. The chest radiograph in legionnaires’ disease: further observations. Radiology 1983; 147:33-34