

1974 OUTBREAK OF LEGIONNAIRES' DISEASE DIAGNOSED IN 1977

Clinical and Epidemiological Features

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Summary An illness characterised by high fever and pneumonia struck 2.9% of a group of the Independent Order of Odd Fellows attending a convention held in Philadelphia, in September, 1974. The convention headquarters was the hotel where the American Legion met in July, 1976. The epidemiological, clinical, and laboratory characteristics of the illness were nearly identical to those of the disease in American legionnaires in 1976. Illness was significantly associated with attendance at one convention activity held on Monday morning, Sept. 16, 1974, in the grand ballroom of the hotel. A serological survey in February and March, 1977, showed that people who had attended the convention and became ill were more likely to have raised indirect fluorescent antibody titres than persons who had attended and remained well. The illness seen in Odd Fellows members in September, 1974, was caused by the legionnaires' disease organism.

Introduction

LEGIONNAIRES' disease dramatically entered the clinical and epidemiological scene in August, 1976.¹ On Aug. 5, 1976, public-health authorities first learned about similar illnesses in some of the 1500 members of the Independent Order of Odd Fellows who had attended a convention on Sept. 13-20, 1974, at the same hotel as the American Legion gathering of July, 1976. When the legionnaires' disease agent was identified in January, 1977,² we did a serological survey of Odd Fellows members to confirm the etiology of the 1974 outbreak.

Methods

In October, 1976, a questionnaire was posted to 450 Odd Fellows randomly selected from the 1400 U.S. residents who had attended the August, 1974, convention. The questionnaire requested basic demographic data, date of onset, and symptoms of any illness in the 18 days after the first day of the convention; occurrence of secondary illness in family members; hotel of residence during the convention; attendance at convention activities; and the name of the respondent's private physician. Because recall of events 2 years later is limited, no questions were asked about exposure to the lobby of the headquarters hotel or the street outside the hotel. Additional cases were identified by investigating anecdotal reports of illness in Odd Fellows members, and these were included in the analysis of clinical and laboratory data.

Clinical and laboratory data were obtained in telephone interviews with the private physicians. Chest X-ray results were confirmed by a radiologist's report.

The case definition paralleled that used in the investigation of legionnaires' disease¹—illness characterised by cough and temperature of 39°C or greater, or any fever and X-ray evidence of pneumonia with onset during the 2 weeks after the last day an Odd Fellows member attended the convention.

In February and March, 1977, sera were collected from those who had been ill and from controls (respondents to the

questionnaire who had remained well) matched for age, sex, and State of residence, for analysis by the indirect fluorescent antibody (I.F.A.) technique.¹

Results

Epidemiological Features

11 cases of illness meeting the case definition of legionnaires' disease were identified among the 392 questionnaire respondents (2.9% attack-rate). The patients were aged 48-77; 7 were men. There were no secondary cases among family members.

There was no association between illness and age, sex, State of residence, or hotel of residence. People who attended the Sept. 16 meeting held in the grand ballroom of the headquarters hotel were more likely to have become ill than were those who did not ($p=0.03$, Fisher's exact binomial test, one-tailed). 10 of the 11 patients attended this meeting; the other patient was staying at the headquarters hotel. The attack-rate among those who attended the meeting in the grand ballroom was 6.5%. No association was found between illness and attendance at any other single convention function or estimated cumulative exposure to the headquarters hotel. This suggests (within the limitations of recall of

TABLE I ---- EPIDEMIOLOGICAL CHARACTERISTICS OF THE FEBRILE RESPIRATORY ILLNESS SEEN IN AMERICAN LEGION (AUGUST, 1, 1976) AND ODD FELLOWS (SEPTEMBER, 1974) CONVENTIONEERS

Group	Median age	M/F	Attack-rate	Case-fatality rate	Incubation period (days)
American Legion	55	3,5/1	4.0%	16.8%	2-10
Odd Fellows	63	1,8/1	2.9%	10%	1-9

events 2 years earlier) a common-source exposure Monday morning, Sept. 16, rather than exposure throughout the convention week. If this is so the incubation periods range from 1 to 9 days with a median of 4 days, nearly identical to those seen in ill legionnaires in 1976.¹

The epidemiological features of the two outbreaks of respiratory illness are compared in table I.

Clinical Features

From the questionnaires and anecdotal reports (9 cases), 20 people with a febrile, respiratory illness meeting the definition of legionnaires' disease were identified. The following case-history illustrates the clinical features of severe illness:

A 47-year-old man from Oklahoma, with no significant medical history but who had smoked two or three packs of cigarettes per day for 25 years, arrived in Philadelphia on Sept. 13, 1974. On Sept. 17 he noted sudden onset of persistent, shaking chills, followed by feverishness. On Sept. 18 he had a dry cough which soon became productive of pale-yellow sputum. By Sept. 19 he was very feverish and had malaise and generalised muscle weakness; cough and chills persisted. On the way home he was seen in a Tennessee hospital emergency room on Sept. 20, where a chest X-ray showed "bilateral pneumonia". He refused admission, so was given ampicillin intramuscularly and a prescription for oral ampicillin. Symptoms worsened, severe dyspnoea developed, and he was admitted to hospital in Oklahoma on Sept. 24.

TABLE II—CLINICAL FEATURES OF THE FEBRILE RESPIRATORY ILLNESS SEEN IN AMERICAN LEGION AND ODD FELLOWS CONVENTIONEERS

Group	% of patients with:										
	Fever	Cough	Malaise	Chills	Dyspnoea	Myalgia	Headache	Rales	Abdominal tenderness	Abnormal chest X-ray	Bilateral changes on chest X-ray
American Legion	97	86	89	74	39	55	53	80	23	83	49
Odd Fellows	100	90	100	94	94	83	71	79	28	100	66

TABLE III—ANTIBODY TITRES AGAINST THE LEGIONNAIRES' DISEASE ORGANISM IN CASES AND MATCHED CONTROLS (MARCH, 1977)

Source	Reciprocal titres											
Cases	32	32	32	32	32	64	64	128	128	256	>1024	
Matched controls	32(2)	32(1)	32(1)	32(2)	32(2)	64(2)	64(1) 32(1)	128(2)	128(1)	256(2)	32(2)	

¹ Numbers in parentheses indicate the number of matched controls obtained for each case.

He was tachypneic (40/min) and diaphoretic, with a temperature of 40°C and cyanosis. Rales and rhonchi were heard in all lung fields, but there was no evidence of consolidation. Liver enlarged but not tender; slight scleral icterus. He was mildly obtunded. Chest X-ray revealed bilateral alveolar infiltrates in all lobes with relative sparing of the left upper lobe; heart size normal. P₂O₂ 50 mm Hg and P₂CO₂ 28 mm Hg. Sputum obtained by transtracheal aspiration later grew normal flora. Penicillin, cephalothin, and gentamicin were administered intravenously and high-flow oxygen by mask.

There was gradual improvement in respiratory status and defervescence during the next 7-10 days, although chest films did not begin to clear until Oct. 10. He was discharged a few days later and has no residual illness.

10 patients were admitted to hospital; there were no significant differences in age or sex between those admitted and those not admitted. 3 patients required intubation and prolonged respiratory support; 2 patients died. Clinical features are summarised in table u. Chest X-rays were done in 12 cases; 8 showed bilateral, patchy infiltrates, and 4 showed unilateral infiltrates. Leucocytosis (10 800 to 24 400/jJ) with a left shift (more than 5% bands) was seen in approximately half the patients, and S.G.O.T. increases (57, 320, and 326 Karman units) were found in 3 of 4 patients. Sputum cultures (including one specimen obtained by transtracheal aspiration and one obtained by bronchoscopy) showed normal flora in four individuals. Sputum cultures from 2 other patients were abnormal; 1 grew *Klebsiella pneumoniae* and 1 grew *Citrobacter* and *Candida*. A lumbar puncture from 1 obtunded patient yielded cerebrospinal fluid that was entirely normal. Pathology specimens were available in 1977 from only 1 patient who was somewhat atypical in that he may have had repeated aspirations which resulted in superimposed acute bronchopneumonia. Microscopic examination of paraffin-embedded lung tissue from this patient revealed gram-negative pneumonia; the changes were not characteristic of legionnaires' disease. Direct fluorescent-antibody studies on these sections were negative for the agent of legionnaires' disease.

In 1977 all but 3 persons had recovered completely. 2 complained of continued easy fatigability and dyspnoea on exertion. 1 person, who was noted to be ataxic upon admission in September, 1974, still had moderate ataxia.

The main features of the febrile, respiratory illness seen in American Legion- conventioneers (T.F. Tsai, unpublished) and that seen in Odd Fellows conventioneers are compared in table n.

Serological Survey (table m)

4 of the 11 cases and none of the 19 controls had reciprocal titres >128 (p=0.037, McNemar test for a variable number of matched controls). 1 patient, whose case-history is reported above, had a reciprocal titre of 8192 in January, 1977, and >1024 in March, 1977. 6 cases and 1 control had reciprocal titres >64 (p=0.01, McNemar). Nobody who had been affected had an illness consistent with legionnaires' disease in the period between October, 1974, and the time the blood-sample was taken. Patients admitted to hospital (presumably the most severe cases) were more likely to have positive titres than were those who had not been admitted (p=0.015, Fisher's exact binomial test, two-tailed).

Discussion

The febrile respiratory illness experienced by Odd Fellows members in September, 1974, is epidemiologically and clinically consistent with legionnaires' disease. The significant association of illness with raised titres to the legionnaires' disease organism detected 30 months after infection is strong evidence that these two outbreaks were caused by the same agent, especially in light of the specificity of this I.F.A. test.² That those with more severe illness in September, 1974, were most likely to have elevated antibody titres indicates that these titres likely reflect infection with the legionnaires' disease organism at that time, rather than at some earlier or later time.

Persistent high I.F.A. antibody titres were also seen in 3 of 4 patients 12 years after a 1965 outbreak of a febrile, respiratory illness, shown to be legionnaires' disease.* The persistence of antibody titres may be helpful in determining the nature and extent of illness caused by this newly recognised organism.

An apparent common-source exposure occurred at the headquarters hotel in Philadelphia on Sept. 16, 1974. Illness in legionnaires in 1976 was associated with the same hotel. Two outbreaks of legionnaires' disease 2

years apart in association with the same location suggest an environmental (animate or inanimate) reservoir for the legionnaires' disease organism.

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