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An Outbreak of Pneumococcal Pneumonia Among Residents of a Retirement Home in France During October 2003 •

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CONCISE COMMUNICATION

An Outbreak of Pneumococcal Pneumonia Among Residents of a Retirement Home in France During October 2003

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We describe an outbreak of pneumonia due to *Streptococcus pneumoniae* in a French retirement home. Eleven residents developed pneumonia. Eight patients had positive results of urinary antigen tests. There were no further cases after the implementation of control measures, which involved isolation of and receipt of antibiotic therapy by symptomatic residents. No risk factors for transmission of *S. pneumoniae* were identified in this population.

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Streptococcus pneumoniae is the main cause of bacterial pneumonia, particularly among elderly persons,¹ with a reported case-fatality rate of 40% among persons with bacteremia. *S. pneumoniae* usually colonizes the upper respiratory tract, a site from which it can be transmitted from person to person.² Outbreaks of severe infection due to *S. pneumoniae* in retirement homes and long-term care geriatric wards have been described elsewhere.³⁻⁷ We present the results of the investigation of an outbreak of pneumonia due to *S. pneumoniae* serotype 4 that occurred in a French retirement home during October 2003 and describe the control measures implemented.

METHODS

We defined a case patient as any resident or staff member of the retirement home in whom pneumonia due to *S. pneumoniae* serotype 4 was detected between September 29 and October 30, 2003. All case patients had a temperature greater than 38°C, at least 1 respiratory symptom (cough, unusual expectoration, dyspnea, thoracic pain, and/or localized pulmonary signs on auscultation), and radiographic evidence of pneumonia in the absence of another cause. For epidemiological and clinical investigation, radiography was systematically done for all patients who had at least 1 respiratory symptom or fever. Among them, the patients with signs of focal consolidation or pleural effusion were tested for *S. pneumoniae* urinary antigens (Binax NOW pneumonia kit; Oxoid). To exclude false-positive results for patients with previous pneumococcal infection, all patients who had a positive result of the urinary antigen test were questioned about their history of other respiratory infections in the past 6 months. To eliminate other causes of pneumonia, the latter subgroup of patients underwent serological testing for detection of an-

tibodies specific to *Legionella pneumophila*, *Mycoplasma pneumoniae*, and *Chlamydia pneumoniae* during the acute phase of the outbreak and 4 weeks after the start of symptoms.

Oropharyngeal swab specimens were obtained from all residents and staff members for detection of *S. pneumoniae* colonization. Culture of the oropharyngeal sample was done on both blood agar and gentamicin blood agar within 2 hours after sampling. All microbiological tests were performed at the bacteriology laboratory of Strasbourg University Hospital (Strasbourg, France). The *S. pneumoniae* strains isolated from samples obtained from the residents and staff members were sent to the national reference center for serotyping with specific antisera provided by the Statens Seruminstitut (Copenhagen, Denmark).

A retrospective cohort study was conducted to describe the outbreak and to investigate risk factors for transmission of the pathogenic strain and acquisition of *S. pneumoniae* infection. Data were collected from individual medical records at the retirement home, and when necessary, the clinicians in charge of case patients (especially those who had lived in the retirement home for less than 5 years) were questioned.

RESULTS

On October 16, 2003, a health warning was sent to local health authorities after 3 residents from the same retirement home in Strasbourg were hospitalized for severe pneumonia. The retirement home housed 94 residents, of whom 85 (90%) were women. The mean age (\pm SD) of the residents was 86 \pm 1 years (range, 55-97 years). The residents' bedrooms were situated on 5 floors. No staff members were concurrently employed by other healthcare facilities.

Medical examinations were performed for all residents on October 17. The 41 residents who presented with fever or at least 1 symptom of respiratory infection were placed under droplet isolation precautions and treated for 6 days with amoxicillin (1 g 3 times per day) or with levofloxacin (500 mg once per day) if allergic to penicillin. On October 22, the 23-valent pneumococcal vaccine (without influenza vaccine) was administered to all residents and all staff members who chose to receive it who did not have respiratory symptoms. No further cases of pneumonia occurred once the control measures were implemented (Figure).

Eleven patients received a diagnosis of pneumonia between October 13 and 17, for an attack rate of 11.7% (Figure). All case patients were female residents (mean age, of 86 years). Three of the 11 case patients died during the study period; 2 died from *S. pneumoniae* infection, for a case-fatality rate of 18.2%. The clinical characteristics and microbiological findings for the case patients are shown in the Table. Results of serological tests for detection of *L. pneumophila*, *M. pneumoniae*, and *C. pneumoniae* were negative for all patients.

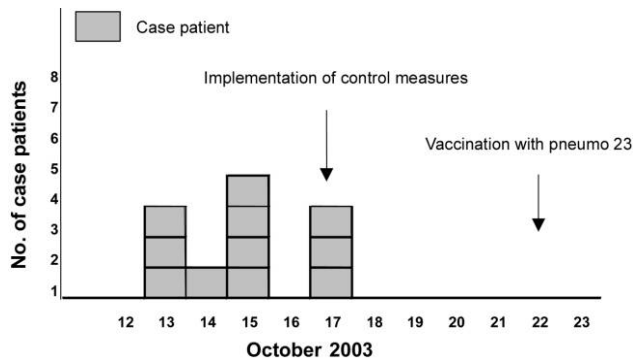


FIGURE. Epidemic curve of an outbreak of pneumococcal pneumonia among residents at a French retirement home during October 2003, showing the date of symptom onset. See Methods for the definition of “case patient” and description of the control measures implemented. Pneumo 23, 23-valent pneumococcal vaccine.

S. pneumoniae serotype 4 was recovered from 1 of the 83 healthy residents for whom oropharyngeal samples were cultured. Thirty-one of these residents had previously been treated with antibiotics.

Investigation of contact between case patients in the retirement home revealed that 6 had neither participated in group activities nor shared a dining table with another case patient. One of these 6 case patients was the only case patient living on the first floor of the retirement home and, therefore, had no known direct contact with the other case patients. However, 4 case patients participated in the same singing and music group on October 8.

The attack rate varied according to the floor of residence, from 9.1% on the third floor to 25% on the fifth floor ($P > .5$). None of the factors investigated in the cohort analysis (age, comorbidities, inability to perform activities of daily living, use

of common areas, and participation in group activities) were identified as risk factors for pneumococcal pneumonia.

Only 1 case patient had received the 23-valent pneumococcal vaccine in the past 3 years. All patients were vaccinated against influenza after the outbreak, in October 2003.

DISCUSSION

We have described an outbreak of infections caused by *S. pneumoniae* among residents of a French retirement home. This epidemic was promptly detected by the alertness of the staff, allowing rapid introduction of control measures (droplet isolation precautions and antibiotic treatment of symptomatic residents). Rapid identification of outbreaks, prompt implementation of preventive measures, and use of effective treatments are essential, given the gravity and risk of transmission of *S. pneumoniae* among institutionalized elderly persons.³⁻⁷

It is possible that the frequency of outbreaks of infection due to *S. pneumoniae* is underestimated because of the difficulty in making diagnoses on the basis of microbiological findings. Detection of the bacteria causing pneumonia is complicated by the difficulty in obtaining high-quality samples (eg, 50%-70% of institutionalized residents cannot expectorate¹). For this reason, we performed urinary antigen tests, as well as typical microbiological tests, for detection of *S. pneumoniae* antigens. In this investigation, the urinary antigen test, used in association with clinical diagnosis, improved our ability to diagnose pneumococcal infection and was the only means of *S. pneumoniae* identification for 2 of the 11 case patients. The published sensitivity for this test varies from 62.5% to 87% for adults with pneumonia caused by *S. pneumoniae*.^{8,9} The specificity of the test is reported to be quite variable for adults, with reported values ranging from 60% to 97% (depending the method used),^{8,9} but a lower specificity is observed for children, especially if they are col-

TABLE. Demographic and Clinical Characteristics of Retirement Home Residents With Pneumococcal Infection, Strasbourg, France, October 2003.

Case patient	Age, y	Initial symptom(s)	Highest temperature, °C	Specimen(s) with a positive test result, by test type		Hospitalized	Died
				<i>S. pneumoniae</i> culture	Pneumococcal antigen test		
1	79	Shock	38.8	Blood, TA	Not done	Yes	Yes
3	95	Cough	37	None	Urine	No	No
4	91	Dyspnea, expectoration	39	Blood, sputum	Urine	Yes	No
6	83	Chills	37	Blood	Urine	Yes	No
7	88	Dyspnea	37.5	TA	Urine	Yes	No
8	84	Dyspnea	38.4	TA	Urine	Yes	No
9	88	Dyspnea, respiratory distress	39	TA	Urine	Yes	Yes
10	79	Neurological symptoms, meningitis	39.7	Blood, TA	Urine, CSF	Yes	Yes
11	85	Dyspnea, productive cough	38.1	None	Urine	Yes	No
2	82	Cough	39	None	None ^a	No	No
5	94	Cough	38.2	None	None ^a	No	No

NOTE. See Methods for the definition of “case patient.” CSF, cerebrospinal fluid; *S. pneumoniae*, *Streptococcus pneumoniae* serotype 4; TA, tracheal aspirate.
^a Urine specimens tested negative for pneumococcal antigen.

onized with *S. pneumoniae*.¹⁰ However, the urinary antigen test can yield positive results soon after the onset of infection and can be useful for the rapid detection of cases in outbreaks caused by *S. pneumoniae*, thus helping to speed up decisions about therapeutic and preventive treatment.

No additional cases were observed after the implementation of isolation measures and use of preemptive antibiotic treatment. These measures were limited to residents with respiratory symptoms, to limit the prescription of antibiotics and, hence, the risk of adverse effects. A rational antibiotic use policy can be part of the management of an outbreak, but a strict protocol based on factors such as antibiotic class, indications for use, and early administration to the at-risk population must be used. Hygiene precautions, including droplet isolation of patients with respiratory signs during an epidemic, are key factors in preventing transmission of respiratory pathogens, especially in nearly closed communities, such as retirement homes for elderly patients.

Outbreaks such as the one described here call into question the role of vaccination in primary prevention of bacteremic pneumoniae or invasive disease. In 1999, the World Health Organization recommended vaccination with the 23-valent polysaccharide vaccine for patients with risk factors for pneumococcal infections, especially for patients older than 65 years of age.¹¹ The effectiveness of vaccination in preventing invasive disease or death during this outbreak could not be evaluated, as too few residents had been vaccinated before the outbreak. A low level of vaccine coverage has often been associated with outbreaks involving elderly patients.^{4,6} Case-control studies have shown that antipneumococcal vaccination confers protection against invasive pneumococcal infections.¹² Randomized trials have not succeeded in demonstrating the efficacy of vaccination against nonbacteremic pneumonia nor its beneficial impact on mortality among elderly patients.¹³ However, vaccination remains the only preventive action against pneumococcal infection and, consequently, against pneumococcal epidemics in retirement homes for elderly persons.

Pneumococcal infections can have serious consequences in elderly persons, and it is important that outbreaks in populations of elderly persons are promptly managed. We recommend isolation of and antibiotic therapy for elderly persons with respiratory symptoms.

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