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Address for correspondence: Etienne Rivière, Service de Médecine Interne et Maladies Tropicales du Pr Longy-Boursier, Centre Hospitalier Universitaire de Bordeaux, Hôpital Saint-André, 1 Rue Jean Burguet, 33000 Bordeaux, France; email: e.riviere@neuf.fr

Pneumonia after Earthquake, Japan, 2011

To the Editor: The earthquake that occurred in Japan on March 11, 2011, triggered an extremely destructive tsunami (*1*), which destroyed cities along the Pacific coastline in the Tohoku area and resulted in the loss of >19,000 human lives. Water from the tsunami inundated ≈33.7% of Tagajo City (population ≈61,000) and caused 188 deaths. Many local residents were left without lifeline utilities, including electricity, gas, water, or any means of transportation and thus were forced to live in crowded shelters or limited small spaces (e.g., the upper floor of their home); ≈11,000 persons were displaced from their damaged or destroyed homes to crowded school gymnasiums or community centers. In March, the mean daily maximum air temperature in Tagajo City was cold (8°C/46.4°F). After the earthquake, cases of pneumonia increased rapidly.

Saka General Hospital is located in this region near the coast. The destruction around the hospital was so severe that persons were without electricity, water, gas, and fuel for several weeks. Fortunately, the hospital laboratory was almost completely functional and could perform bacterial and other tests at a near-normal level, despite the earthquake. However, several other hospitals in the area were severely damaged and thus had difficulty treating patients with severe pneumonia.

To determine the characteristics of pneumonia after the earthquake, we conducted a retrospective study of patients who had pneumonia during the 6 weeks before the earthquake and the first 9 weeks after the earthquake. To identify patients with pneumonia, we checked all chest radiographs and computed tomography scans of adult patients (>16 years of age) who had visited the hospital. We examined clinical and bacteriologic data for these patients. We excluded from the study patients without sputum culture and patients with other conditions, such as lung cancer, pulmonary infarction, or cardiac failure.

During the 6 weeks before the earthquake, pneumonia had been diagnosed for 49 adults (controls), and within the 9 weeks after the earthquake, community-acquired or health care–associated pneumonia was newly diagnosed for 172 adults. Patient data from 2 pre-earthquake periods and 3 postearthquake periods are shown in the Table. Although the number of patients with pneumonia in the first 3 weeks after the earthquake increased sharply, no substantial differences were noted in mean age, death rates, or underlying concurrent conditions among these patients. The interval between the onset of respiratory signs and symptoms and a diagnosis of pneumonia did not increase after the earthquake. The proportion of patients who received antimicrobial drugs before the diagnosis of pneumonia (premedication) in the early postearthquake period did not differ significantly. The number of patients with pneumonia peaked in the first 3 weeks after the earthquake, followed by a gradual decrease starting from 4 weeks after the earthquake.

Chest radiographs were taken and hematologic examinations were performed for all patients; computed tomography of the chest and rapid diagnostic tests for influenza were performed for 42.2% and 54.2% of 83 patients, respectively, who had pneumonia in the early postearthquake period. During the first 3 weeks after the earthquake, *Haemophilus influenzae* and *Moraxella catarrhalis* were more predominant than *Streptococcus pneumoniae*; most strains were isolated from purulent sputum specimens. In contrast, pneumonia caused by enterobacteria, staphylococci, or atypical pathogens did not increase after earthquake.

Table. Characteristics of patients with pneumonia before and after the earthquake and tsunami, Japan, 2011*

Characteristic	Weeks before disaster		Weeks after disaster		
	4–6	1–3	1–3	4–6	7–9
Patients with pneumonia, no.	26	23	83	51	38
CAP	20	19	57	39	24
HCAP	6	4	26	12	14
Isolates from sputum culture, no. (%)					
Streptococcus pneumoniae	8 (30.8)	2 (8.7)	19 (22.9)	10 (19.6)	4 (10.5)
Haemophilus influenzae	4 (15.4)	4 (17.4)	27 (32.5)	8 (15.7)	4 (10.5)
Moraxella catarrhalis	1 (3.8)	0	26 (31.3)	9 (17.7)	3 (7.9)
Purulent sputum, (Geckler 4 or 5), %	14 (53.8)	10 (43.5)	51 (61.4)	24 (47.1)	16 (42.1)
Mean age, y	73.7	76.0	75.5	76.0	74.9
Location of patient at illness onset, no.					
Shelter	NA	NA	36	13	6
Own or friend's home	NA	NA	37	29	23
Nursing home / home visit by doctor	NA	NA	10	9	9
Patient's hospital status, no.					
New patient	7	3	32	19	20
Routinely examined at hospital	19	20	51	32	18
Rate of hospital admission, %	76.9	73.9	77.1	64.7	78.9
Deaths, no. (%)	3 (11.5)	1 (4.3)	6 (7.2)	2 (3.9)	3 (7.9)
Underlying disease, %					
Respiratory disease	8 (30.8)	12 (52.2)	29 (34.9)	19 (37.3)	13 (34.2)
Other	18 (69.2)	11 (47.8)	54 (65.0)	31 (60.8)	23 (60.5)
Healthy	1 (3.8)	0	8 (9.6)	5 (9.8)	2 (5.3)
Interval from onset to diagnosis, mean no. days	3.96	2.43	2.51	3.22	2.89
Antimicrobial premedication, no., %	2 (7.7)	0	4 (4.8)	11 (21.6)	3 (7.9)

*CAP, community-acquired pneumonia; HCAP; health care–acquired pneumonia; NA, not applicable.

Detection rates of *H. influenzae* remained constant at 15.4% (4/26 patients); before the earthquake the rate was 17.4% (4/23), and soon after the earthquake it increased to 32.5% (27/83). Detection rates of *M. catarrhalis* increased from 0–3.8% before the earthquake to 31.3% (26/83) after the earthquake (p<0.01). These bacterial strains were isolated widely from refugees at shelters and from persons living at home without running water and/or electricity. Soon after the earthquake, it was thought that infections with these strains were not part of a localized outbreak but were widespread in the region. Most patients from whom *M. catarrhalis* was isolated were located throughout the area flooded by the tsunami. In contrast, many patients with *H. influenzae* were mainly located outside the flooded area. There was no regional imbalance in isolation of *S. pneumoniae*.

It was reported that living in a multiple-bedroom residence and the winter season were risk factors for outbreaks of *M. catarrhalis* (2–4). Similar outbreaks of *H. influenza* infections were reported (4,5). Cold shock at a physiologically relevant temperature of 26°C promotes *M. catarrhalis* adherence to upper respiratory tract cells and can contribute to virulence (6).

The possibility of a pseudo-epidemic must also be considered. The substantial increase in the number of new patients at Saka General Hospital, as a result of the severe damage to other hospitals in this area and the changed patient profiles (community-acquired pneumonia, hypothermia, trauma), might have largely affected the etiology of pneumonia. We found no increase in cases of severe pneumonia caused by resistant bacteria or aspiration pneumonia in elderly patients. We conclude that multiple localized small community outbreaks might have occurred widely in this area after earthquake.

**Hiroshi Takahashi,
Shigeru Fujimura,
Satoshi Ubukata,
Eizaburo Sato, Makoto Shoji,
Mutsuko Utagawa,
Toshiaki Kikuchi,
and Akira Watanabe**

Author affiliations: Saka General Hospital, Tagajo, Japan (H. Takahashi, S. Ubukata, E. Sato, M. Shoji, M. Utagawa); Tohoku University, Sendai, Japan (S. Fujimura, A. Watanabe), and Tohoku University School of Medicine, Sendai (T. Kikuchi)

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Address for correspondence: Shigeru Fujimura, Research Division for Development of Anti-Infective Agents, Institute of Development, Aging and Cancer, Tohoku University, 4-1, Seiryo-machi, Aoba-ku, Sendai, 980-8575, Japan; email: fujimo@idac.tohoku.ac.jp

Severe Pneumonia Caused by *Legionella pneumophila* Serogroup 11, Italy

To the Editor: *Legionella pneumophila* serogroups (SGs) 1–16 cause pneumonia in humans. Although SG 1 is the serogroup most commonly associated with disease (*1*), we report a case of community-acquired legionellosis caused by SG 11.

In November 2010, a 42-year-old man was admitted to Modena University Hospital, Modena, Italy, with a 4-day history of fever, dyspnea, and cough. His vital signs were as follows: temperature 40.0°C, pulse 135 beats/min, blood pressure 110/60 mm Hg, respiratory rate 30 breaths/min, and oxygen saturation 85% in room air. Inspiratory crackles were heard in the left lower lung lobe. Chest radiographs and successive high-resolution computerized tomography revealed left lobar infiltrates (Figure, panels A and B). Blood count documented severe pancytopenia together with high levels of inflammation markers: fibrinogen (1,031 mg/dL), C-reactive protein (33 mg/dL), and procalcitonin (28.5 ng/mL). The patient's medical history was unremarkable; however, results of tests conducted at the time of hospital admission led to the diagnosis of acute leukemia.

Empirically prescribed antimicrobial treatment for neutropenic patients was initiated and consisted of meropenem (3 g/day) and levofloxacin (500 mg/day), combined first with vancomycin (2 g/day) and later with linezolid (1,200 mg/day). A few days later, antifungal therapy was empirically added to the treatment regimen (liposomal amphotericin B at 3 mg/kg/day). The patient received continuous positive airway pressure, which resulted in progressive improvement of blood gas exchange, until normalization was achieved.

Serologic and molecular examination and culture of bronchoalveolar lavage fluid, blood, urine, and feces produced negative results for fungal, viral, and bacterial pathogens. Test results for *L. pneumophila* urinary antigen (Biotest AG, Dreieich, Germany) and IgM and IgG against *L. pneumophila* (Serion-Immundiagnostica GmbH, Würzburg, Germany) were negative. Culture of sputum collected at the time of
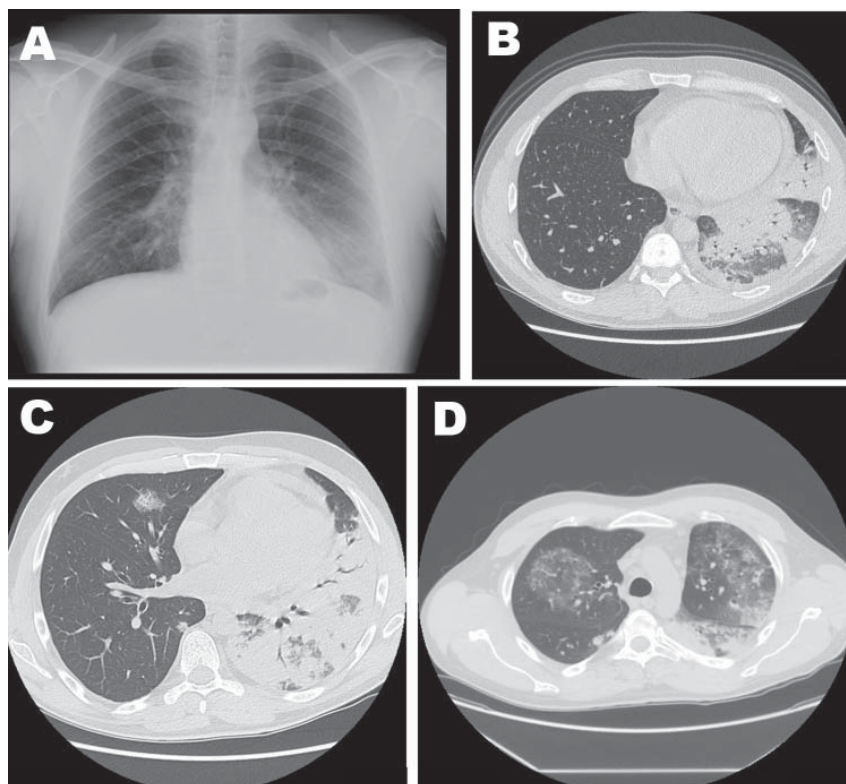

Figure. Imaging studies of 42-year-old man with severe pneumonia caused by *Legionella pneumophila* serogroup 11, showing lobar consolidation of the left lower lung lobe, with an air-bronchogram within the homogeneous airspace consolidation. Consensual mild pleural effusion was documented by a chest radiograph (A) and high-resolution computed tomography (B). A week after hospital admission, repeat high-resolution computerized tomography of the chest showed extensive and homogeneous consolidation of left upper and lower lobes, accompanied by bilateral ground-glass opacities (C and D).