

An outbreak of legionellosis attributable to a "one-day-trip hot spring" – Saitama Prefecture.....	157	Rapid detection of viable <i>Legionella</i> bacilli .....	165
An outbreak of legionellosis attributable to a bathing facility in a hotel – Yamagata Prefecture.....	159	Assessing <i>Legionella</i> contamination by measuring ATP levels for monitoring hygienic conditions of bathing facilities .....	167
Legionellosis cases associated with the Great East Japan Earthquake, which were reported to NESID.....	160	Disinfection of bathing water by monochloramine – Shizuoka Prefecture .....	168
Typing of clinical isolates of <i>Legionella</i> – report from <i>Legionella</i> Reference Center.....	161	Legionellosis – various sources identified in the recent infections .....	169
Detection of <i>Legionella</i> species from puddles – Toyama Prefecture ....	163	Human coronavirus isolates from infants with respiratory symptoms (January–April, 2013) – Mie Prefecture.....	170
Epidemiological studies on clinical isolates of <i>L. pneumophila</i> serogroup 3, sequence type 93 – Okayama Prefecture .....	164	HIV/AIDS in Japan, January–March, 2013 .....	173

### <THE TOPIC OF THIS MONTH> Legionellosis, January 2008–December 2012

Legionellosis is an infectious disease caused by Gram-negative bacteria belonging to the genus *Legionella*. It is a respiratory tract infection and the bacteria multiply within alveolar macrophages. There are two clinical types, severe form of pneumonia called Legionnaires' disease and flu-like Pontiac fever. As the symptoms of *Legionella* pneumonia are not unique, differentiation from other pneumonias by symptoms alone is difficult. The first choices for chemotherapy are quinolones and macrolides. Sudden worsening of the general condition may occur among patients, who were not treated with appropriate antibiotics. Pontiac fever is a less severe form of infection and the symptom is like common cold. Elderlies, newborns and immunocompromised persons constitute high-risk groups of legionellosis.

*Legionella* bacilli live within protozoa (amoeba) that inhabit water, moist soil, etc. Optimum growth temperature is 36°C with permissive range of 20–45°C.

**Incidence of legionellosis:** Legionellosis is a category IV notifiable infectious disease in the National Epidemiological Surveillance of Infectious Diseases (NESID) under the Infectious Diseases Control Law (<http://www.nih.go.jp/niid/images/iasr/34/400/de4001.pdf>). Physicians who have made diagnosis of legionellosis are obliged to notify all the cases.

From January 2008 to December 2012, 4,081 legionellosis patients (including 31 asymptomatic carriers) were reported (as of May 15, 2013) (Table 1). The peak season of legionellosis was mostly July (Fig. 1). More patients were reported from more populated prefectures as expected (<http://www.nih.go.jp/niid/images/iasr/34/400/graph/f4002a.gif>). Number of patients per 100,000 was high in Toyama, Ishikawa, Okayama and Tottori Prefectures (Fig. 2). The average patients' age was 67.0 years, 65.7 years in males and 72.5 years in females. While the patients' ages were distributed widely from 0 year to 103 years, patients younger than 30 years were few (1.0%) (Fig. 3). Males occupied 81% of the patients. According to MMWR 60: 1083–1086, 2011, males were 64% of the patients in USA. Occupations at high risk were reported to be mining and construction, manufacturing of metal materials, assembly and/or repair of transportation machines, and car driving, etc. Symptoms are fever (92%), pneumonia (90%), cough (48%), dyspnea (44%), disturbance of consciousness (17%), diarrhea

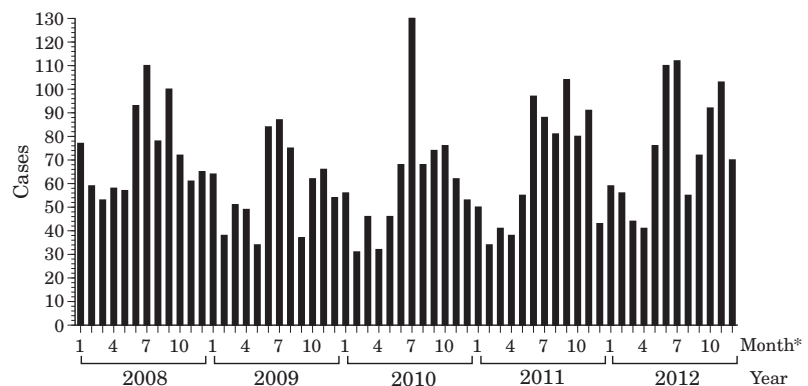
Table 1. Notified cases of legionellosis, 1999–2012

Year of diagnosis	Total	Male	Female
1999*	56	42	14
2000	154	125	29
2001	86	78	8
2002	167	139	28
2003	147	127	20
2004	160	151	9
2005	281	252	29
2006	518	452	66
2007	668	527	141
2008	896	693	203
2009	712	578	134
2010	751	620	131
2011	819	675	144
2012	903	735	168

\*April–December

(National Epidemiological Surveillance of Infectious Diseases: Data based on the reports as of May 15, 2013)

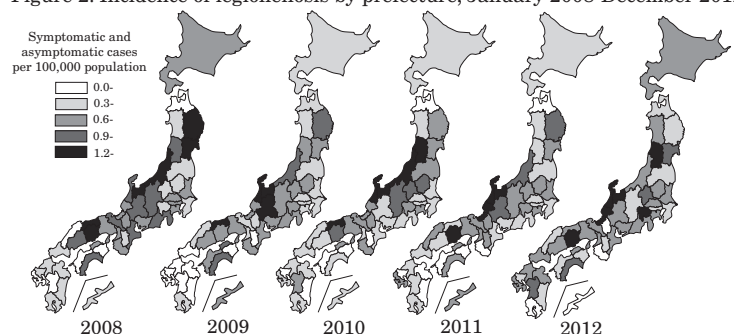
Figure 1. Monthly incidence of legionellosis cases, January 2008–December 2012



\* The day of the first consultation

(National Epidemiological Surveillance of Infectious Diseases: Data based on the reports received before May 15, 2013)

Figure 2. Incidence of legionellosis by prefecture, January 2008–December 2012



(National Epidemiological Surveillance of Infectious Diseases: Data based on the reports received before May 15, 2013)

(Continued on page 156')

(THE TOPIC OF THIS MONTH-Continued)

(9.8%), multiple organ failure (8.5%), and abdominal pain (2.5%) (percentage in parenthesis indicates percentage among the notified patients having the symptom indicated). As for the location of infection, 3,962 cases (97%) were infected in Japan, 95 cases (2.3%) abroad and 24 cases (0.6%) unknown.

**Methods of diagnosis:** Of 4,081 cases, 3,928 (96%) were diagnosed by antigen detection in urine, 113 cases (2.8%) by bacterial culture, 69 (1.7%) by titration of serum antibody, 62 (1.5%) by PCR (including LAMP method), and 8 (0.2%) by the indirect fluorescent antibody method or by the enzyme-linked antibody method (Table 2 on p.157 of this issue).

While antigen detection in urine was used in a great majority, it can detect only *Legionella pneumophila* serogroup (SG) 1. The LAMP assay that can detect a wide range of genus *Legionella* started to be covered by the medical insurance since October 2011. In 2012, 5 cases were diagnosed by this method.

The number of deaths among the total cases was 134 (3.3%) for 2008-2012. Among 4,023 patients having the record of the first medical consultation, there were 129 deaths. It was noted that the longer was the delay from the first consultation to the definitive diagnosis, the higher was the fatality rate, i.e., 2.8% for 0-3 day delay, 4.2% for 4-6 day delay and 5.3% for  $\geq 7$  day delay. Early diagnosis is important for saving lives of the patients.

**Species of *Legionella* isolated by culture:** In addition to the above 113 culture-positive cases, reported were additional 148 cases that included isolates provided to the *Legionella* Reference Center after the notification (see p. 161 of this issue). Thus *Legionella* was isolated from total 261 cases. Among them, there were 216 cases attributable to infection of *L. pneumophila* SG1. Some such cases of infection with *L. pneumophila* SG1 were infected additionally with other *Legionella* species or serogroups, such as, *L. feeleii* (one case), *L. rubrilucens* (one case), *L. pneumophila* SG6 (two cases), and *L. pneumophila* SG6 and SG9 and untypable (one case). There were 24 cases due to *L. pneumophila* other than *L. pneumophila* SG1; six cases each due to infection with SG2 and SG3, four cases due to infection with SG6, two cases each due to infection with SG5, SG10 and SG12, and one case each due to infection with SG9 and SG15. Furthermore, there were one case of *L. londiniensis*, one case of *L. longbeachae*, and 19 cases of *Legionella* whose species were not identified.

**Outbreaks:** Outbreaks that occurred in Japan during 2008-2012 involved 2 cases at a public bathing facility in Kobe City in January 2008 (IASR 29: 329-330, 2008); 2 cases at a welfare facility for the elderly in Okayama Prefecture in July 2008 (IASR 29: 330-331, 2008); 8 cases attributable to a bathing facility in a hotel in Gifu Prefecture in October 2009 (IASR 31: 207-209, 2010); 9 cases attributable to a bathing facility of a sports club in Yokohama City in September 2011; 3 cases attributable to a bathing facility in a hotel in Yamagata Prefecture in November 2012 (see p. 159 of this issue); and 9 cases attributable to a "one-day-trip hot spring" in Saitama Prefecture in November to December 2012 (see p. 157 of this issue). There were 13 suspected clusters, each reporting 2-5 legionellosis patients that were found among those who used the same facilities or toured together. In addition, after the tsunami associated with the Great East Japan Earthquake, legionellosis was reported among those who were rescued from drowning or engaged in debris processing (see p. 160 of this issue).

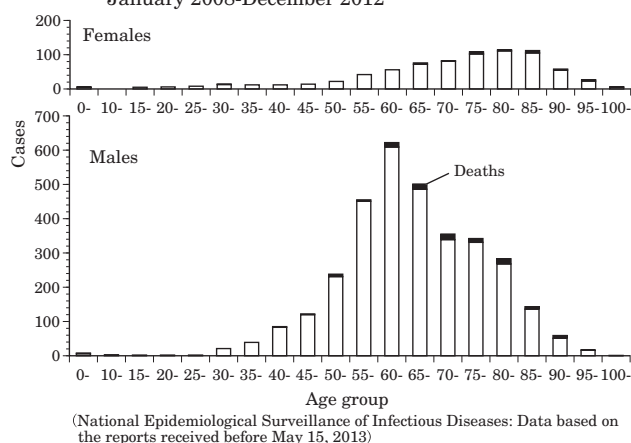
**Control measures:** *Legionella* infection occurs through inhalation of aerosols or dusts contaminated by *Legionella*. The infection source includes spa pools, cooling towers, showers (IASR 31: 331-332, 2010 & 31: 332-333, 2010), hot water supply system, landscaping water, humidifiers (see p.169 of this issue), solar water-heaters (IASR 32: 113-115, 2011) and leaf molds (IASR 26: 221-222, 2005). Biofilm growing on porous natural stones in a bath sometimes becomes a hotbed of *Legionella* (IASR 29: 193-194, 2008).

Principles of prevention of legionellosis include 1) prevention of microbial growth and biofilm formation, 2) removal of biofilm formed on equipments and facilities, 3) minimizing aerosol splash, and 4) minimizing of bacterial contamination from external sources. For this, following measures should be taken. Firstly, water should be disinfected (see p.168 of this issue), which should be checked by culture of microbes or by rapid tests (see p.165 of this issue). The current hygienic standard of bath water that may pose risk of aerosol inhalation is *Legionella* counts less than 10 cfu per 100 ml (below the detection limit). Secondly, the wall of bath rooms and inner surface of water tanks should be cleaned. Removal of the biofilm can be checked by measuring adenosine-tri-phosphate (ATP) (see p.167 of this issue). Thirdly, equipments and facilities should be designed so as not to splash aerosols. Fourthly, those who clean the wall of bathrooms or hand leaf molds should wear a dust mask.

Hygienic control for prevention of legionellosis should follow guidelines, such as Legionella Control Measures (Ministry of Health, Labour and Welfare: MHLW), Building Hygiene (MHLW), Guidelines for prevention of legionellosis (3<sup>rd</sup> Ed., Building Management Education Center), Introduction to hygienic maintenance of storage-type hot-water supply equipment (1<sup>st</sup> Ed., Japan Water Facilities Environmental Hygiene Association).

For prevention of legionellosis, infection sources should be identified by analyzing the data obtained from the pulsed-field gel electrophoresis and sequence-based typing using *Legionella* obtained from both patients and environment (see p.161 of this issue). With such information, disinfection and/or removal of *Legionella* can be effectively conducted.

Figure 3. Age distribution of legionellosis cases, by gender, January 2008-December 2012



The statistics in this report are based on 1) the data concerning patients and laboratory findings obtained by the National Epidemiological Surveillance of Infectious Diseases undertaken in compliance with the Law Concerning the Prevention of Infectious Diseases and Medical Care for Patients of Infections, and 2) other data covering various aspects of infectious diseases. The prefectural and municipal health centers and public health institutes (PHIs), the Department of Food Safety, the Ministry of Health, Labour and Welfare, and quarantine stations, have provided the above data.

(THE TOPIC OF THIS MONTH-Continued)

表2. レジオネラ症の診断方法内訳 2008~2012年 (感染症発生動向調査:2013年5月15日現在報告数)

Table 2. Methods of diagnosis for legionellosis, 2008-2012

診断方法 Methods of diagnosis	年 Year					合計 Total
	2008	2009	2010	2011	2012	
A. 分離・同定による病原体の検出 A. Isolation and/or identification of <i>Legionella</i>	6 (17)	3 (21)	12 (28)	11 (26)	13 (21)	45 (113)
B. 蛍光抗体法による病原体抗原の検出 (酵素抗体法を含む) B. Fluorescent antibody detection of <i>Legionella</i> antigens (including immunoenzyme method)	- (2)	3 (3)	1 (1)	-	- (2)	4 (8)
C. 尿中の病原体抗原の検出 C. Detection of <i>Legionella</i> antigens in urine	858 (879)	674 (695)	701 (720)	771 (790)	831 (844)	3,835 (3,928)
D. PCR法による病原体遺伝子の検出 (LAMP法を含む) D. PCR detection of the bacterial genome (including LAMP method)	2 (9)	6 (10)	9 (12)	8 (11)	17 (20)	42 (62)
E. 間接蛍光抗体法による血清抗体の検出 E. Detection of serum antibodies by indirect immunofluorescence assay	9 (11)	4 (7)	7 (8)	9 (11)	25 (25)	54 (62)
F. マイクロプレート法による血清抗体の検出 F. Detection of serum antibodies by microplate agglutination test	-	-	2 (2)	1 (1)	4 (4)	7 (7)
AおよびC Methods A and C	10	15	15	15	8	63
AおよびCおよびD Methods A, C, and D	1	1	1	-	-	3
AおよびCおよびE Methods A, C, and E	-	1	-	-	-	1
AおよびD Methods A and D	-	1	-	-	-	1
BおよびC Methods B and C	2	-	-	-	2	4
CおよびD Methods C and D	6	2	2	2	3	15
CおよびE Methods C and E	2	2	1	1	-	6
CおよびDおよびE Methods C, D, and E	-	-	-	1	-	1
合計 Total	896	712	751	819	903	4,081

( ): 複数の診断方法による検出数を含めた場合の全数 ( ): Total number of cases including those diagnosed by more than one method.  
(National Epidemiological Surveillance of Infectious Diseases: Data based on the reports as of May 15, 2013)