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National Institute of Infectious Diseases and
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Control Division,
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<THE TOPIC OF THIS MONTH>
Cryptosporidiosis and Giardiasis as of July 2014

Cryptosporidiosis and giardiasis are intestinal protozoan infectious diseases that often manifest as non-bloody watery diarrhea. The parasites are transmitted fecal-orally as oocysts or cysts. Under the Infectious Diseases Control Law, they are classified as category V infectious diseases requiring reporting of all the cases. Physicians who make a diagnosis of these infections must notify within 7 days of diagnosis (http://www.nih.go.jp/niid/images/iasr/35/414/de4141.pdf, http://www.nih.go.jp/niid/images/iasr/35/414/de4142.pdf). Notification requires laboratory diagnosis, via microscopic detection of pathogens or its antigens or genes (see p. 197 of this issue). In the laboratory, *Cryptosporidium* must be handled as a class 4 pathogen under the Infectious Diseases Control Law.

Cryptosporidiosis

The disease is caused by *Cryptosporidium*, an enteric, protozoan coccidian parasite. *C. hominis* (formerly classified as *C. parvum* genotype 1 or anthroponotic genotype) mainly infects humans and *C. parvum* (formerly classified as *C. parvum* genotype 2 or bovine genotype) mainly mammals. While *C. meleagridis* (avian type) does not commonly infect humans, infections, including outbreaks, have been reported (IASR 29: 22-23, 2008).

Oocysts, spherical in shape and 5μm in diameter (see Fig. 1 in p. 198 of this issue), are shed via stools. Oocytes are resistant to chlorine disinfectants, and outbreaks that occur through contamination of tap water, swimming pools, or fountains tend to become large-scale. Ministry of Health, Labour and Welfare issued the "Guidelines on prevention of cryptosporidiosis caused by contaminated tap water (Ken-sui-hatsu No. 0330005, 30 March 2007)", which recommend implementation of necessary measures such as appropriate filtration or UV light treatment (see p. 187 of this issue). Other modes of transmission include consumption of contaminated foods, contact with infected patients (including sexual contact) or animals, and opportunistic infections.

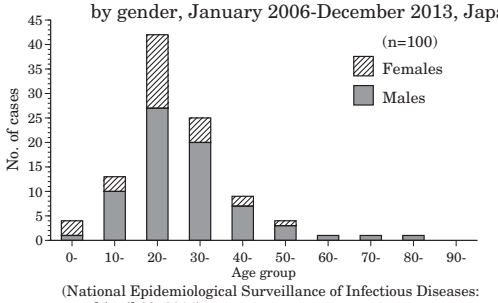
The median incubation period is 6 days (range 4 to 8 days) (see p. 190 of this issue). While watery diarrhea may continue for about 10 days, there are no effective treatments. Prevention of dehydration is the standard treatment for otherwise healthy

Table 1. Notified cases of cryptosporidiosis and giardiasis, April 1999-July 2014, Japan

Year of diagnosis	Cryptosporidiosis	Giardiasis
1999 (Apr.-Dec.)	4	42
2000	3	98
2001	11	137
2002	109	113
2003	8	103
2004	92	94
2005	12	86
2006	18	86
2007	6	53
2008	10	73
2009	17	70
2010	16	77
2011	8	65
2012	6	72
2013	19	82
2014 (Jan.-Jul.)	80	37

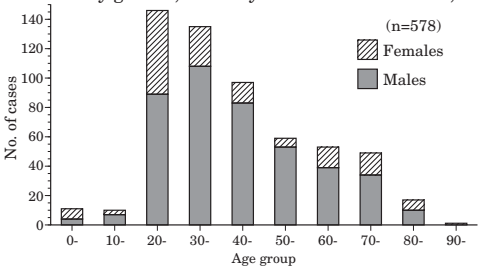
(National Epidemiological Surveillance of Infectious Diseases: as of July 30, 2014)

Figure 1. Age distribution of cryptosporidiosis cases, by gender, January 2006-December 2013, Japan



(National Epidemiological Surveillance of Infectious Diseases: as of April 22, 2014)

Figure 2. Age distribution of giardiasis cases, by gender, January 2006-December 2013, Japan



(National Epidemiological Surveillance of Infectious Diseases: as of April 22, 2014)

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(THE TOPIC OF THIS MONTH-Continued)

Table 2. Transmission route/factor of cryptosporidiosis, 2006-2013 (n=100)

Transmission route/factor	Reported cases
Contact with cattle	32
Travel abroad	27
Sexual contact among men who have sex with men	11
Food (raw meat and/or raw liver)	4
Others*	2
Unknown**	24

*Ingestion of organic fertilizer, handling of dung.
**Including 7 cases with underlying disease or immunological disorder.
(National Epidemiological Surveillance of Infectious Diseases: as of April 22, 2014)

Table 3. Transmission route/factor of giardiasis, 2006-2013 (n=578)

Transmission route/factor	Reported cases
Travel abroad*	250
Sexual contact*	71
(among men who have sex with men	42)
Exposure to sewage or stools	6
Outbreak (water tank of the building)	4
Unknown	251

*Four cases were suspected overlaped transmission route.
(National Epidemiological Surveillance of Infectious Diseases: as of April 22, 2014)

patients. Immunocompromised patients may develop persistent, refractory, and wasting diarrhea which may be fatal if proper treatment to recover immune function is not provided.

The largest outbreak documented in Japan occurred in Ogose-cho in Saitama Prefecture in 1996. Caused by contaminated tap water, as many as 8,800 people (approximately 70% of the habitants), fell ill (IASR 17: 217-218, 1996). Other large outbreaks include an outbreak in a multi-tenant building (due to contamination of the water tank) (IASR 15: 248-249, 1994) and an outbreak associated with the use of a swimming pool (IASR 26: 167-168, 168-169, 169-170 & 170-171, 2005). An outbreak affecting more than 10 persons receiving on-site training at a cattle ranch has also been reported (IASR 30: 319-321, 2009)

National Epidemiological Surveillance of Infectious Diseases (NESID): Reported surveillance data through 2005 are found in IASR 26: 165-166, 2005. From 2006 to 2013, annually 6 to 19 cases were reported (Table 1). Common modes of transmission included contact with cattle, travel abroad to developing countries (where contaminated food or water consumption were suspected), sexual contact among men who have sex with men (MSM), and food poisoning (Table 2). Among outbreaks associated with cattle contact, one was due to contact with calves during on-site training for students at a farm (see p. 188 of this issue) and another due to an outdoor event that included contact with cattle (see p. 189 of this issue). Typical food poisoning cases include those such as the one reported in 2006, caused by consumption of raw beef ("yukhoe") and/or raw liver (IASR 28: 88-89, 2007). A large-outbreak involving tens of primary school students and teachers during on-site training was occurred in June 2014, but the source and mode of transmission are still under investigation.

Some cryptosporidiosis cases were co-infected with other pathogens, such as *Giardia* or *Entamoeba histolytica* (IASR 28: 298-299, 2007). Several cases among MSM were infected with both *Cryptosporidium* and HIV (see p. 192 of this issue). Among reported Cryptosporidiosis cases, males in their twenties were most frequent (Fig. 1).

No large scale waterborne outbreak has been reported in Japan since 2006. Outside of Japan, however, from 2004 to 2010, there were at least 120 waterborne outbreaks reported (see p. 194 of this issue), including the largest ever documented outbreak (an estimated 27,000 cases in 2010) in Europe (see p. 195 of this issue).

Giardiasis

The disease is caused by an intestinal protozoan parasite, *Giardia*. Human infection is caused by *G. lamblia* (syn. *G. duodenalis* or *G. intestinalis*), which is classified into 8 genotypes (assemblages from A to H), among which assemblages A and B are most frequently isolated from humans. The cysts of *Giardia*, although resistant to chlorine, can be relatively easily removed by filtration that can remove *Cryptosporidium* because the cysts of *Giardia* (5-8 × 8-12μm) are larger than the oocysts of *Cryptosporidium* (see Fig 2 in p. 199 of this issue). Giardiasis is effectively treated with metronidazole, which is covered by the national health insurance since 2012.

NESID: From 2006 to 2013, 578 giardiasis cases were notified (Table 1) and in 2010, an outbreak, uncommon in recent years in Japan, was reported (see p. 191 of this issue). Among reported giardiasis cases, males in their twenties were most frequent (Fig. 2). Common modes of transmission included travel abroad to developing countries, sexual contact (42 of 71 were among MSM), and exposures to sewage or stool (Table 3). Twenty-six cases (4.5% of the total cases) were co-infected with other pathogens, such as *Entamoeba histolytica*, *Cryptosporidium*, *Salmonella* Typhi, *S*. Paratyphi, *Shigella*, or HIV (see p. 192 of this issue).

Although giardiasis is usually accompanied by diarrhea, 17% of the patients (98/578) had no diarrhea but experienced abdominal discomfort and 2.2% (13/578) were asymptomatic. It should be noted that the asymptomatic carriers exist as sources of infection although they do not require notification under the Infectious Diseases Control Law. Notably, *Giardia* was detected from duodenal, bile and pancreatic excretes of 63 cases (11%) who received gastrointestinal endoscopy. *Giardia* has been occasionally detected from patients with cholecystitis symptoms (see p. 194 of this issue).

Cryptosporidiosis, giardiasis, and other protozoan infections, such as infection with *Cyclospora* (see p. 196 & Fig 3 in p. 199 of this issue), *Isospora*, *Entamoeba histolytica*, occur widely throughout the world. Measures that should be taken for these protozoan infections are similar to those that are taken for *Cryptosporidium* and *Giardia*, such as infection control, adequate hand washing, and proper heating and/or treatment of food and water. For cases of diarrhea of unknown etiology, *Cryptosporidium* and *Giardia* should be included in the laboratory differential diagnosis.

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.

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