

(range 3–12 days). No complications occurred during any of the treatment regimens. Although a relapse occurred 15 days after completion of treatment in the oldest patient, who had received cefotaxime and oral tosufloxacin, re-treatment cured the infection without fecal carriage.

The high attack rate may reflect the high sensitivity of adolescents to typhoid fever and the high level of bacterial contamination in food the participants had eaten during travel (2). Although the meal at the private home was suspected as the source of infection, we could not determine the exact cause of this outbreak.

The optimum treatment for MDR and NAR enteric fever has not yet been established. A third-generation cephalosporin or high doses of fluoroquinolones (e.g., ciprofloxacin, 20 mg/kg/day or levofloxacin, 10 mg/kg/day) for 10–14 days are the drugs of choice (1,2). Azithromycin is also a promising agent (8). However, for any of the regimens, the mean fever clearance times are relatively long ( $\approx 7$  days), and the relapse rates are high (1). Although all 6 isolates showed reduced susceptibility to ciprofloxacin, a long course (14 days) of fluoroquinolones was still effective in this outbreak. However, clinicians should be aware of treatment failure in MDR and NAR enteric fever (3). The combination therapy of cefotaxime and a fluoroquinolone used in 3 patients has not shown greater efficacy than monotherapies. In fact, 1 patient who received this combination therapy experienced a relapse.

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**Yasuyuki Kato,\*<sup>1</sup>**  
**Makiko Fukayama,†<sup>2</sup>**  
**Takuya Adachi,‡<sup>3</sup>**  
**Akifumi Imamura,§**  
**Takafumi Tsunoda,¶**  
**Naohide Takayama,§**  
**Masayoshi Negishi,§<sup>4</sup>**  
**Kenji Ohnishi,\***  
**and Hiroko Sagara‡**

\*Tokyo Metropolitan Bokutoh Hospital, Tokyo, Japan; †Tokyo Metropolitan Toshima Hospital, Tokyo, Japan; ‡Yokohama Municipal Citizen's Hospital, Yokohama, Japan; §Tokyo Metropolitan Komagome Hospital, Tokyo, Japan; and ¶Tokyo Metropolitan Ebara Hospital, Tokyo, Japan

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<sup>1</sup>Current affiliation: International Medical Center of Japan, Tokyo, Japan

<sup>2</sup>Current affiliation: Tokorozawa Loyal Hospital, Saitama, Japan

<sup>3</sup>Current affiliation: Japan International Cooperation Agency, Tokyo, Japan

<sup>4</sup>Current affiliation: Negishi Medical Clinic, Tokyo, Japan

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Address for correspondence: Yasuyuki Kato, Disease Control and Prevention Center, International Medical Center of Japan, Toyama 1-21-1, Shinjuku-ku, Tokyo 162-8655, Japan, email: [ykato@imcj.hosp.go.jp](mailto:ykato@imcj.hosp.go.jp)

## Human Rabies Cluster Following Badger Bites, People's Republic of China

**To the Editor:** From February 2002 to April 2004, 7 rural residents of Coteau County (population 450,000) in western Zhejiang Province in eastern People's Republic of China died of rabies following badger bites (Figure). In this county, 89% of residents are farmers. The county covers 4,475 km<sup>2</sup>, and the terrain is mountainous. No other cases of human rabies had been reported from this county since 1986. We investigated the cluster to ascertain characteristics of these exposures.

Rabies testing was not readily available. In China, the national case definition is based on clinical compatibility with appropriate animal exposure. Doctors are required to report rabies according to a general case description published by the Ministry of Health. Laboratory confirmation is not generally performed. We defined a rabies case as any person from Coteau County in whom rabies was diagnosed by a physician from February 2002 through March 31, 2007. We interviewed family members of case-patients and neighbors about the char-

acteristics of the illness and activities associated with badgers, dogs, and other animals that are potential rabies reservoirs.

From February 2002 to April 2007, a total of 8 human rabies cases were reported from Coteau County. Seven case-patients had badger exposure and 1 had cat exposure. Badger-associated rabies occurred from February 2002 to December 2004; 1- to 2-month intervals generally occurred between cases. The average yearly incidence rate for human rabies in the county was 0.52 per 100,000 compared to 0.15 per 100,000 for China for the same period. Patients ranged in age from 18 to 76 years (mean 54 years). Badger-associated rabies was confined to 7 contiguous townships in the center of the county. Signs and symptoms were typical of rabies, namely, fever, excitation, aerophobia, hydrophobia, dysphagia, and hypersalivation, leading to coma and death. Incubation periods ranged from 31 to 100 days (mean 45 days).

All 7 case-patients with badger-associated rabies had tried to catch badgers that were sluggish and could not escape. All bites occurred on the fingers, when the badger was captured

or carried home. The captors killed and ate 2 badgers, 4 badgers died spontaneously, and the fate of 1 badger was not known. The cat-associated rabies case from the same area occurred in February 2004. The cat died spontaneously during the same period when some badgers died spontaneously nearby. We found no other villagers who had been bitten by these or other badgers. The case-patients and family members did not know that badgers can transmit rabies and did not seek treatment or postexposure prophylaxis. These case-patients had no other exposure to bites from other potentially rabid animals in the 10 years before onset.

The 7 case-patients lived in villages covering an area of  $\approx 10$  km<sup>2</sup>, representing  $\approx 0.2\%$  of the total county area. The individual villages were 1,500–3,000 m apart. All were on the same side of a mountain ridge. Mountainous terrain and limited transportation isolate this county from nearby counties. Villagers reported seeing dead badgers before human cases occurred. During the past 20 years in this county,  $\approx 15,000$  persons received rabies postexposure prophylaxis after dog bites, but no rabies occurred. During 2002–2004, no human rabies cases

followed exposure to dogs that were within 50 km of this county.

After 2004, we set up a rabies surveillance and health education system in this county. At the end of 2004, we advised the public in this and 5 neighboring counties to avoid catching and killing badgers and, if bitten, to seek postexposure prophylaxis. Since that recommendation, no human rabies has occurred in the area. In 2006, a total of 1,719 residents were treated for animal bites. The incidence of animal exposures in this county is higher than in the United States (1). Dog bites accounted for 86% (1,471), cat bites for 9.5% (164), and other animals for 4.9% (84) of exposures. However, no badger bites were reported.

We concluded that an epizootic of badger rabies affected a limited area of Coteau County from 2002 through 2004. Badgers can easily transmit the virus and could be an important secondary host of rabies (2). Research is needed on badgers as a natural reservoir of human rabies and on control of this disease in wildlife hosts (3,4). A national surveillance system for animal rabies should be set up in this region (5).

A major limitation of this study is the lack of laboratory support for surveillance of both human and animal rabies. Accordingly, we based our conclusion on clinical and epidemiologic histories. The lack of human cases from dogs could be attributed to effective postexposure prophylaxis of humans following dog bites. On the other hand, rabies following dog bites is the number-one cause of death from infectious diseases in China, in part because of absent or incomplete postexposure prophylaxis for poor rural residents. Thus, the complete absence of reported dog-associated rabies is unusual. China is planning increased investment in rabies surveillance and prevention that will include recommended laboratory support and should help alleviate this situation in the future (3).



Figure. Badger: a new natural reservoir of human rabies? (Image source: Ian Stickland)

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**Gong Zhenyu,\*† Wang Zhen,\*  
Chen Enfu,\* He Fan,\*  
Lin Junfen,\* Li Yixin,\*‡  
Ding Gangqiang,\*  
and R.E. Fontaine†**

\*Zhejiang Provincial Center for Disease Control and Prevention, Zhejiang, People's Republic of China; †Chinese Center for Disease Control and Prevention, Beijing, People's Republic of China; and ‡Chunan Center for Disease Control and Prevention, Chunan, Zhejiang, People's Republic of China

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Address for correspondence: Gong Zhenyu, Zhejiang CDC, Emergence Response, 17 Lao Zhe Da Zhi Rd., Hangzhou, Zhejiang 310009, People's Republic of China; email: 87235011@163.com

## *Diphyllobothrium latum* Outbreak from Marinated Raw Perch, Lake Geneva, Switzerland

**To the Editor:** *Diphyllobothrium latum*, a fish tapeworm, has a complex cycle including copepods and freshwater fish as intermediate hosts. Humans are infected by eating raw or undercooked fish meat. Clinical consequences of human infection are generally absent or mild, although anemia due to vitamin B12 deficiency was described in Scandinavia (1). Freshwater fish host the parasite in some lakes of Switzerland, Italy, Scandinavia, north-eastern Canada, and South America (1–4). Lake Geneva, in Switzerland, harbors perch, pike, and char, which are considered to be food delicacies and may act as secondary intermediate hosts. Perch are heavily infested (5,6). To date, *D. latum* has reportedly caused only sporadic cases in western Europe. One outbreak has previously been described in South Korea after 5 persons ate raw redlip mullet. Identification of the *Diphyllobothrium* species in that outbreak was uncertain (7).

Since 2001, medical centers in the lake region have reported an increasing number of human cases. We report, to our knowledge, the first outbreak of *D. latum* infections in this region, which occurred after a wedding party in June 2006. The menu included raw, marinated perch fillets caught the same day in Lake Geneva. After *D. latum* infection was diagnosed in 2 guests, all those who attended (n = 32) were contacted within 4 months after the wedding. Information was collected with a standardized questionnaire on personal characteristics; past infection with *D. latum*; consumption of raw perch during the wedding, raw freshwater fish in the last 5 years, or both; and symptoms or visible proglottids

in stools. All participants who ate the raw perch dish during the wedding had a stool sample examined for ova and proglottids at the Laboratory of Parasitology of the Geneva University Hospitals. Species identification relied on egg and proglottid morphologic characteristics and epidemiologic factors.

A confirmed case-patient was defined as a case in a guest who ate raw perch at the wedding and had characteristic eggs or proglottids in stool. A probable case-patient was defined as a person who ate raw perch during the wedding and reported a “tagliatelle-like” worm of varying length in stools, without a history of consumption of raw beef, pork, or other raw fish in the previous 5 years and in the absence of laboratory examination of stool sample. All confirmed case-patients received a single 10-mg/kg dose of praziquantel. Stool examination was repeated after treatment.

Twenty-six wedding guests ate raw marinated perch. Seven confirmed cases and 1 probable case of *D. latum* infection occurred (attack rate 30.8%). Infected persons had a median age of 34 years (range 24–60 years) and were more likely to be female. Microscopic examination showed characteristic eggs in 7 patients' stools and both eggs and proglottids in 3 patients.

None of the patients reported symptoms within 7 days after the dinner. Two patients remained asymptomatic at interview but both were reporting visible worm segments in stools. Six patients (75%) reported symptoms that started 20–91 days after the wedding (median 56 days). Reported symptoms were diarrhea (6 patients), fatigue (5), abdominal pain (4), nausea (3), loss of weight (2), vomiting (1), or dizziness (1). No patient required urgent medical care or missed work. The mean interval between the wedding and the first observation of visible proglottids in stool was 40 days. Seven patients were treated with a single 10-mg/kg dose of praziquantel