A. phagocytophilum infection has been reported in I. persulcatus and engorged D. silvarum ticks in northeastern China (3). In this study, we also found Haemaphysalis spp. ticks, including H. longicornis and H. concinna ticks, to be infected by the agent. This finding indicates that various tick species may be involved in the maintenance and transmission of A. phagocytophilum. Both H. longicornis and H. concinna ticks usually have 3 hosts in their life cycle and can infest a variety of wild and domestic animals such as rodents, deer, scaly anteaters, sheep, goats, and dogs. Haemaphysalis ticks are distributed in a broad range of China and sometimes feed on humans. Their competency as a vector for A. phagocytophilum and the importance of this agent in public health as well as in veterinary medicine has yet to be investigated, particularly in the areas where they are predominant (9). The gltA sequence analyses indicated that the agents detected in this study were similar to the strains isolated from rodents and sheep in northeastern China (4) and to A. phagocytophilum strains from the Russian Far East adjacent to our survey sites. However, the strains from China are genetically distant from A. phagocytophilum strains in the United States and Europe. The genetic diversity of A. phagocytophilum in various geographic locations deserves further study.

Acknowledgments

We are grateful to Fu Weiming, Li Ming, Wen Zhanqing, and Ding Dawei for assistance in tick collection.

This study was supported by grants from the National Science Fund for Distinguished Young Scholars (30725032), the Natural Science Foundation of China (30700682, 30872196) and the National “973” Basic Research Program (2010CB530201).

Jia-Fu Jiang, Bao-Gui Jiang, Ji-Hong Yu, Wen-Yi Zhang, Hong-Wei Gao, Lin Zhan, Yi Sun, Xiao-Ai Zhang, Pan-He Zhang, Wei Liu, Xiao-Ming Wu, Rong-Man Xu, and Wu-Chun Cao

Author affiliations: State Key Laboratory of Pathogen and Biosecurity, Beijing, People’s Republic of China; and Institute of Microbiology and Epidemiology, Beijing

DOI: 10.3201/eid1705.101630

References


Address for correspondence: Wu-Chun Cao, Beijing Institute of Microbiology and Epidemiology, China, Department of Epidemiology, 20 Dongda St, Feng Tai District, Beijing 100071, People’s Republic of China; email: caowc@nic.bmi.ac.cn

Japanese Encephalitis, Tibet, China

To the Editor: Tibet is located in the Qinghai-Tibet Plateau of western People’s Republic of China and has been internationally recognized as a Japanese encephalitis (JE)–nonendemic area because the average altitude is thought to be too high to facilitate the cycle of Japanese encephalitis virus (JEV) between mosquitoes and vertebrates (1,2). In addition, JE is a reportable infectious disease in China, and no clinically confirmed case has been reported in Tibet since establishment of a national case reporting system in 1951 (3,4). Neither the mosquito vector of JEV nor JEV isolates have been described in Tibet. In this study, JEV was isolated from Culex tritaeniorhynchus mosquitoes, the main vectors of JEV, collected in Tibet. Serologic assays detected anti-JEV antibodies in a large number of human and porcine serum samples collected in this region. These data demonstrate that JEV is currently circulating in Tibet.

During August 5–15, 2009, mosquitoes were collected in Mainling...
County (altitude 2,900 m) and Medog County (altitude 1,000 m) in the Nyingchi area of Tibet. A total of 4,089 mosquitoes representing 7 species (Cx. tritaeniorhynchus, Cx. pipiens pallens, Cx. bitaeniorhynchus, Anopheles maculatus maculatus, An. peditaeniatus, and Aedes albopictus) from 4 genera were collected in this study. The dominant mosquito species detected in Medog County was Cx. tritaeniorhynchus (2,442 [71.1%] of 3,436 mosquitoes collected there) (Table); no previous reports have described this species in Tibet. A total of 653 mosquitoes were collected in Mainling County, of which 489 (74.9%) were Armigeres obturans. No Cx. tritaeniorhynchus mosquitoes were collected in Mainling County.

Mosquitoes were homogenized in 97 pools by using TissueLyser (QIAGEN, Hilden, Germany) and screened with reverse transcription–PCR (RT-PCR) by using seminested primers designed to detect the JEV PreM gene (5). One Cx. tritaeniorhynchus pool, XZ0938, collected in Medog County was positive by PCR. Isolation of virus was conducted from PCR-positive sample by injecting mosquito homogenate supernatants into monolayers of BHK-21 and C6/36 cells. The supernatant of pool XZ0938 caused cytopathic effects in BHK-21 and C6/36 cells in successive cell passages. The complete genome of 10,965 nt was sequenced (GenBank accession no. HQ652538) as described (6), which included a 96-nt 5′ nontranslated region and a 570-nt 3′ nontranslated region. The single open reading frame coded for a polyprotein of 3,432 aa. Compared with the complete genome sequences of 62 known JEV isolates, the nucleotide sequence identity varied from 83.6% to 97.8% and amino acid sequence identity from 94.9% to 99.7%. Phylogenetic trees derived from nucleotide sequences of the complete genome of JEV strains indicated that XZ0938 was a member of genotype I JEV. A more detailed analysis indicated that the Tibet JEV is most closely related to JEV isolates KV1899 (1999, Korea, AY316157), and JEV/sw/Mie/41/2002 (2002, Japan, AB241119) (data not shown).

To determine whether local residents were infected by JEV, 248 human serum samples were collected in Mainling and Medog Counties from healthy persons. Neutralizing antibody against JEV was tested by 90% plaque-reduction neutralization tests by using standard methods (7). Serum samples were tested with serial 2-fold dilutions from 1 to 5. Diluted serum was mixed with equal volumes of culture medium containing JEV P3 strain. The samples were considered positive when the neutralizing antibody titers ≥10. Sixty-eight positive samples were determined by 90% plaque-reduction neutralization tests, which constituted 68 (27.4%) of all 248 serum samples. Twenty-two (22.0%) of 100 and 46 (31.1%) of 148 serum samples in Mainling and Medog Counties, respectively, were positive (Table). Currently, the local population is not vaccinated against JEV (8) because Tibet is considered free of JE because of its elevation. Factors such as global warming, increased pig farming, and increased tourism and transportation may have contributed to the emergence of JE in Tibet. Conditions in Tibet, including the presence of the primary vector (Cx. tritaeniorhynchus mosquitoes), abundant amplification hosts (pig), and a naive population that has not been vaccinated against JEV, present the possibility for JE outbreaks. Increased surveillance for JE in this region is needed.

**Acknowledgments**

We thank David Wang for consultation and assistance in preparing and writing this manuscript.

---

**Table. Results from testing of mosquitoes, humans, and pigs for JEV, Nyingchi area, Tibet, People’s Republic of China, 2009***

<table>
<thead>
<tr>
<th>Collection sites</th>
<th>Mosquitoes</th>
<th>Humans</th>
<th>Pigs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. collected</td>
<td>Culex tritaeniorhynchus, no. (%)</td>
<td>No. samples</td>
</tr>
<tr>
<td>Mainling County</td>
<td>653</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Medog County</td>
<td>3,436</td>
<td>2,442 (71.1)†</td>
<td>148</td>
</tr>
<tr>
<td>Total</td>
<td>4,089</td>
<td>2,442 (59.7)</td>
<td>248</td>
</tr>
</tbody>
</table>

*JEV, Japanese encephalitis virus; Ig, immunoglobulin.
†Pool was positive for JEV by PCR.
This work was supported by grants from the Ministry of Science and Technology, China (2003BA712A08-01; 2008ZX10004-001; 2011CB504702); China–US CDC Cooperative Agreement U19-GH000004; and Development Grant of State Key Laboratory for Infectious Disease Prevention and Control (2008SKLID105).

Yi-Xing Li,† Ming-Hua Li,† Shi-Hong Fu, Wei-Xin Chen, Qi-Yong Liu, Hai-Lin Zhang, Wa Da, Song-Lin Hu, Sang Dan La Mu, Ju Bai, Zun-Dong Yin, Hong-Yue Jiang, Yu-Hong Guo, Dun Zhu Duo Ji, Hui-Mei Xu, Ge Li, Gu Gu Cuo Mu, Hui-Ming Luo, Jing-Lin Wang, Jun Wang, Xiu-Min Ye, Zhuo Ma Yang Jin, Wei Zhang, Gui-Jun Ning, Huan-Yu Wang, Gui-Chang Li, Jian Yong, Xiao-Feng Liang, and Guo-Dong Liang

Author affiliations: National Immunization Programme, Chinese Center for Disease Control and Prevention, Beijing, People’s Republic of China; (Y.-X. Li, Z.-D. Yin, H.-M. Luo, G.-J. Ning, X.-F. Liang); Institute for Viral Disease Control and Prevention, Beijing (M.-H. Li, S.-H. Fu, W.-X. Chen, H.-Y. Jiang, J.-L. Wang, H.-Y. Wang, G.-D. Liang); National Institute for Communicable Disease Control and Prevention, Beijing (Q.-Y. Liu, Y.-H. Guo, J. Wang, G.-C. Li); Yunnan Institute of Endemic Disease Control and Prevention, Yunnan, People’s Republic of China (H.-L. Zhang); Tibet Center for Disease Control and Prevention, Tibet, People’s Republic of China (W. Da, D.Z.D. Ji, X.-M. Ye); Nyingchi Center for Disease Control and Prevention, Tibet (S.-L. Hu, H.-M. Xu, Z.M.Y. Jin); Medog County Center for Disease Control and Prevention, Tibet, (S.D.L. Mu, G. Li, W. Zhang, J. Yong); Mainling County Center for Disease Control and Prevention, Tibet (J. Bai, G.G.C. Mu)

References


Address for correspondence: Guo-Dong Liang, State Key Laboratory for Infectious Disease Prevention and Control, Institute for Viral Disease Control and Prevention, Chinese Center for Disease Control and Prevention, 100 Yingxi St., Xuanwu District, Beijing 100052, People’s Republic of China; email: gdliang@hotmail.com

Babesia sp. EU1
Infection in a Forest Reindeer, the Netherlands

To the Editor: Fatal piroplasmosis in domestic reindeer (Rangifer spp.) was first reported by Kertzelli in 1909; he named the piroplasm Piroplasma tarandus rhangferis. Similar piroplasms also were observed in blood smears of reindeer that had a condition known as spleen disease, which occurred in the second part of summer in the Arctic tundra and was characterized by clinical signs such as splenomegaly, icterus, pale mucous membranes, and death (1). Hemoglobinuria, a characteristic sign of babesiosis, is not mentioned in these early 20th century reports. However, these signs were observed in a Babesia divergens–infected reindeer herd in Scotland (2).

The only other reported cases of severe babesiosis in reindeer and caribou (Rangifer tarandus caribou) were caused by B. odocoilei, a predominantly nonpathogenic parasite of white-tailed deer (Odocoileus virginianus) that can cause fatal infection in reindeer (3,4). Babesia sp. EU1 is a recently recognized zoonotic Babesia species that has been associated with human babesiosis in Europe and is phylogenetically related to the B. odocoilei parasite (3). We report on a juvenile reindeer with babesiosis caused by Babesia sp. EU1.

A 5-week-old, captive-bred, female forest reindeer from an otherwise healthy herd of 9 animals in a zoo in the Netherlands was euthanized after showing clinical signs of lethargy, jaundice, and hemorrhagic diarrhea for >8 hours that did not improve after treatment with butylscopolamine (Buscopan; Boehringer Ingelheim, Alkmaar, the Netherlands) and enrofloxacin (Baytril; Bayer, Leverkusen, Germany). At necropsy, jaundice was evident in the sclera, aorta, and