High-Risk Regions of Human Brucellosis in China: Implications for Prevention and Early Diagnosis of Travel-Related Infections

To the Editor—Human brucellosis is caused by transmission of Brucella from animal reservoirs to humans by direct contact with infected animals or consumption of raw animal products such as unpasteurized milk or cheese. In many countries, brucellosis is underreported, and thus, official statistics reflect only a fraction of its true incidence [1]. Although its true incidence in China remains largely unknown, the incidence of human brucellosis is estimated to vary from <0.03 to >160 individuals per 100 000 population [2, 3]. Various sanitary, socioeconomic, and political factors have led the epidemiology of human brucellosis to change drastically over the past 2 decades [4, 5]. One important factor has been increased domestic and international travel [6]. This, together with the lack of awareness of brucellosis in low-incidence areas, impeded its recognition in these areas. Such initial lack of recognition typically results in delayed diagnosis and treatment, which may lead to chronic infection, and thus great economic and health problems for sufferers [2].

Increasing awareness of brucellosis and its distribution is important for both clinicians and travelers for achieving prevention, early diagnosis, and treatment. To assist in these endeavors, this study analyzed the spatial and time distribution of human brucellosis cases in China to identify high-risk regions. Information of the cases reported from January 2004 to December 2010 from the national surveillance system was collected. The geographic data for each case were extracted and a spatial incidence database was constructed. The incidence for each county was calculated, and space and time distribution and cluster identification were analyzed by using SaTScan and ArcGIS software as described previously [7]. As shown in Figure 1, 2 clusters were identified: a primary cluster (cluster I) and a secondary cluster (cluster II). Cluster I includes a total of 117 counties distributed at the junctions of Inner Mongolia, Hebei, Liaoning, Jilin, and Heilongjiang provinces, which were inhabited by 37.416.402 residents and reported 61.067 cases during the study period. Analysis of the data revealed the relative risk to be 40.093 and the log-likelihood ratio to be 151.573 ($P < .001$). Cluster II includes 331 counties at the junctions of Hebei, Shanxi, Inner Mongolia, Henan, Shanxi, and Ningxia provinces, which were inhabited by 104.103.364 residents and reported 29.595 cases during the study period. The relative risk and log-likelihood ratio were 5.236 and 23.130 ($P < .001$), respectively. The relative risk of transmission in cluster I is approximately 7.6 times that of cluster II.

Investigation of high-risk factors for human brucellosis in 5 counties in cluster I identified animal contact and consumption of products from infected animals as the most significant factors. The diagnosis of human brucellosis in cluster I is relatively timely compared with that in other regions ($P < .001$). Because treatment within 3 months is generally efficacious [8], we recommend that clinicians and travelers remain aware...
of high-risk regions and necessity of timely diagnosis of human brucellosis. Persons who have traveled to such high-risk regions within the past 3 months and experience atypical symptoms of unknown origin, such as undulant fever, malaise, and arthralgia, should be alert to the possibility that they have contracted brucellosis.

**Notes**

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Zeliang Chen,¹ Wenyi Zhang,¹ Yuehua Ke,¹ Yufei Wang,¹ Baolei Tian,² Dali Wang,³ Buyun Cui,⁴ Wen Zou,¹ Shenzong Li,¹ Liuyu Huang,¹ and Hongbin Song¹

¹Institute of Disease Control and Prevention, and ²Beijing Institute of Radiation Medicine, Academy of Military Medical Sciences, Beijing; ³Plague and Brucellosis Prevention and Control Base, Chinese Center for Disease Control and Prevention, Baicheng, Jilin; and ⁴National Institute for Communicable Disease Control and Prevention, Chinese Center for Disease Control and Prevention, Beijing, Changping, People’s Republic of China

**References**


*Z. C., W. Z., Y. K., Y. W., and B. T. contributed equally to this work.

Correspondence: Hongbin Song, PhD, Institute of Disease Control and Prevention, Academy of Military Medical Sciences, No. 20, Dongdajie, Fengtai District, Beijing 100071, PR China (hongbinsong@263.net).