The spatiotemporal distribution of human brucellosis in mainland China from 2007-2016

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Abstract

Objective: Despite the considerable efforts made to address the issue of brucellosis worldwide, its prevalence in dairy products continues to be difficult to estimate and represents a key public health issue around the world. The aim of the study was to understand the epidemiology of this disease in mainland China. We set out to investigate the yearly spatial distribution and possible hot-spots of the disease.

Methods: Human brucellosis data from mainland China between 2007 and 2016 were collected from the China Information System for Disease Control and Prevention. A geographic information system ArcGIS10.3 (ESRI, Redlands) was used to identify potential changes in the spatial and temporal distribution of human brucellosis in mainland China during the study period.

These distributions were evaluated using three-dimensional trend analysis and spatial autocorrelation analyse. A gravity-center was used to analyse the migration track of human brucellosis.

Results: A total of 399,578 cases of human brucellosis were reported during the 10-year study period. The monthly incidence of brucellosis in China demonstrates clear seasonality. Spring and summer are the peak seasons, while May is the peak month for brucellosis. Three-dimensional trend analysis suggests that brucellosis is on the rise from south to north, and that the epidemic situation in northern China is more severe. Between 2007 and 2016, the overall migration distance of the brucellosis incidence gravity-center was 906.43 km, and the direction was southwest. However, the overall gravity center of brucellosis was still in the northern part of China. In the global autocorrelation analysis, brucellosis in China demonstrated a non-random distribution between 2013 and 2014, with spatial autocorrelation ($Z > 1.96$, $P < 0.05$) and a clustering trend, while no clustering trend was found from 2007 to 2012 or from 2015 to 2016. In the local autocorrelation analysis, a Low-Low cluster phenomenon was found in the south of China in 2013 and 2014.

Conclusion: Human brucellosis remains a widespread challenge, particularly in northern China. The hotspots highlight potential high-risk areas which may require special plans and resources for monitoring and controlling the disease.

Keywords : Human brucellosis; mainland China; geographic information system; spatial

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed.

However, the manuscript can be downloaded and accessed as a PDF.

Figures

Figure 1

Time distribution of human brucellosis incidences in China from 2007 to 2016.

Figure 2

Three-dimensional trend analysis of average incidences of brucellosis in mainland China between 2007 and 2016.

Figure 3

The center of gravity migration track of human brucellosis in China from 2007 to 2016. (The small black dots in the picture show the gravity center of brucellosis between 2007-2016, during which the gravity center of brucellosis were mainly concentrated in northern China.)

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Figure 4

Spatial distribution of human brucellosis incidences in mainland China from 2007 to 2016 (1/100,000). (The darker the color, the higher the incidence, the lighter the color, the lower the incidence. It is obvious that high incidence areas were concentrated in the north of China.) Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

Figure 5

Local spatial autocorrelation analysis of incidences of human brucellosis in mainland China between 2013 and 2014. (Bright red indicates High-Low association, bright blue indicates Low-High, light red indicates High-High and light blue indicates Low-Low. In 2013, there was a low-low aggregation area. In 2014, there was a high-low aggregation area and a low-low aggregation area.) Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.