International Journal of Infectious Diseases 33 (2015) 67–70

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

Case Report

Primary case of human pneumonic plague occurring in a Himalayan marmot natural focus area Gansu Province, China

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ARTICLE INFO

Article history:
Received 27 October 2014
Received in revised form 19 December 2014
Accepted 22 December 2014

Corresponding Editor: Eskild Petersen, Aarhus, Denmark

Keywords:
Primary pneumonic plague
Dogs
Marmota himalayana
Indirect hemagglutination test
Epidemiological investigation

SUMMARY

A case of primary pneumonic plague (PPP) caused by *Yersinia pestis* is reported. This case occurred in the largest plague area in China. The patient died after contact with a dog that had captured an infected marmot. Three of 151 contacts were shown to be positive for antibody against F1 antigen by indirect hemagglutination assay, but none had clinical symptoms. There was no secondary case.

1. Introduction

China has faced plague throughout history.[1] With efficient prevention and control, human cases are significantly reduced; however sporadic cases still emerge.

The Qinghai–Tibet plateau natural plague focus area is the largest in China. The primary reservoir is the Himalayan marmot *Marmota himalayana* (and rodents), with annual outbreaks in animals occasionally spreading to humans.[2,3] Capturing and flaying marmots is the main cause of human infection. With increased awareness, fewer people are flaying marmots and human cases are decreasing.

2. Case report

The index case was a 38-year-old male shepherd. On July 11, 2014, he seized a marmot from a dog while grazing sheep. His older brother then dismembered the marmot and fed the meat to five dogs, including the dog that had captured it. The man began to have a fever on July 13. On July 14, he went to Yumen City and talked with his sister-in-law and neighbours. His condition deteriorated rapidly on July 15 and he went to the village clinic. From there he was transferred to the local hospital where a preliminary diagnosis of upper respiratory infection was made; this was treated with antipyretics, anti-inflammatory agents, and clindamycin. However, his condition worsened and he was transferred to Yumen People's Hospital.

Examinations showed a pathology of both lungs; he had a partially dilated intestine, pleural effusion in the left lung, and a pericardial effusion. The diagnosis of severe pneumonia was made and he was given anti-inflammatories, fluid replacement, and cefoperazone sodium. At 10:30 p.m., blood, sputum, and a throat swab were taken for serological tests and strain isolation. The serum was collected to determine the F1 antibody concentration via indirect hemagglutination assay (IHA).[4,5] A reverse IHA was used to detect the *Yersinia pestis* F1 antigen from sputum and throat samples.[2]

At 11:30 p.m. on July 15, sputum and blood smears showed a Gram-negative bacillus with rounded darker ends. The patient was

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http://dx.doi.org/10.1016/j.ijid.2014.12.044

diagnosed as a suspected plague case and was reported to the Infectious Disease Reporting System.

At 00:10 a.m. on July 16, the patient's blood pressure decreased and he became short of breath and produced red frothy sputum. The breath was low in the left lung and there was a wet rattle in both lungs. He was treated with 1 g streptomycin intramuscular (IM), 8 mg gentamicin intravenous (IV), and dopamine. At 5:00 a.m., there were signs of dysphoria, polypnea, and cardiac arrest; he immediately received assisted respiration, external cardiac massage, and electric defibrillation. The patient died at 5:57 a.m. At 1:30 a.m. on July 16, antibody to F1 antigen was detected at a titre of 1:40 (serum); the reverse IHA showed titres of 1:6400 (throat) and 1:12 800 (sputum). PCR for *Y. pestis fra* and *pla* was positive.[6,7] On July 18, *Y. pestis* strains were isolated from sputum, blood, and throat swab samples,[8] and identified by bacteriophage lysis test and PCR.

Experts including epidemiologists, bacteriologists, and doctors diagnosed the case as one of primary pneumonic plague (PPP).

Among 151 contacts, 63 were close contacts in the outpatient and inpatient departments and their escorts, and these contacts were immediately quarantined; the other 88 were indirect contacts and visitors, and they were isolated in their homes (Figure 1). Examination of paired sera of the 151 contacts using the IHA (on July 16 and 20) showed the sister-in-law to have an F1 antibody titre that increased from 1:16 to 1:64; two of the outpatients transfused in the same room had F1 antibody titres of 1:16. The remaining contacts were negative.

Five dogs fed with the marmot were positive for F1 antibody with titres of 1:32 ($n = 1$) and 1:128 ($n = 4$; including the dog that had captured the marmot). One dog that had not eaten the marmot was F1-negative.

Beginning on July 16, preventive medications were given to the 151 contacts: streptomycin IM (0.75 g on July 16) and oral sulfadiazine (2 g per day from July 17 to 21, in three doses per day). All contacts were quarantined for 9 days under professional medical observation. At 9 a.m. on July 17, the corpse and

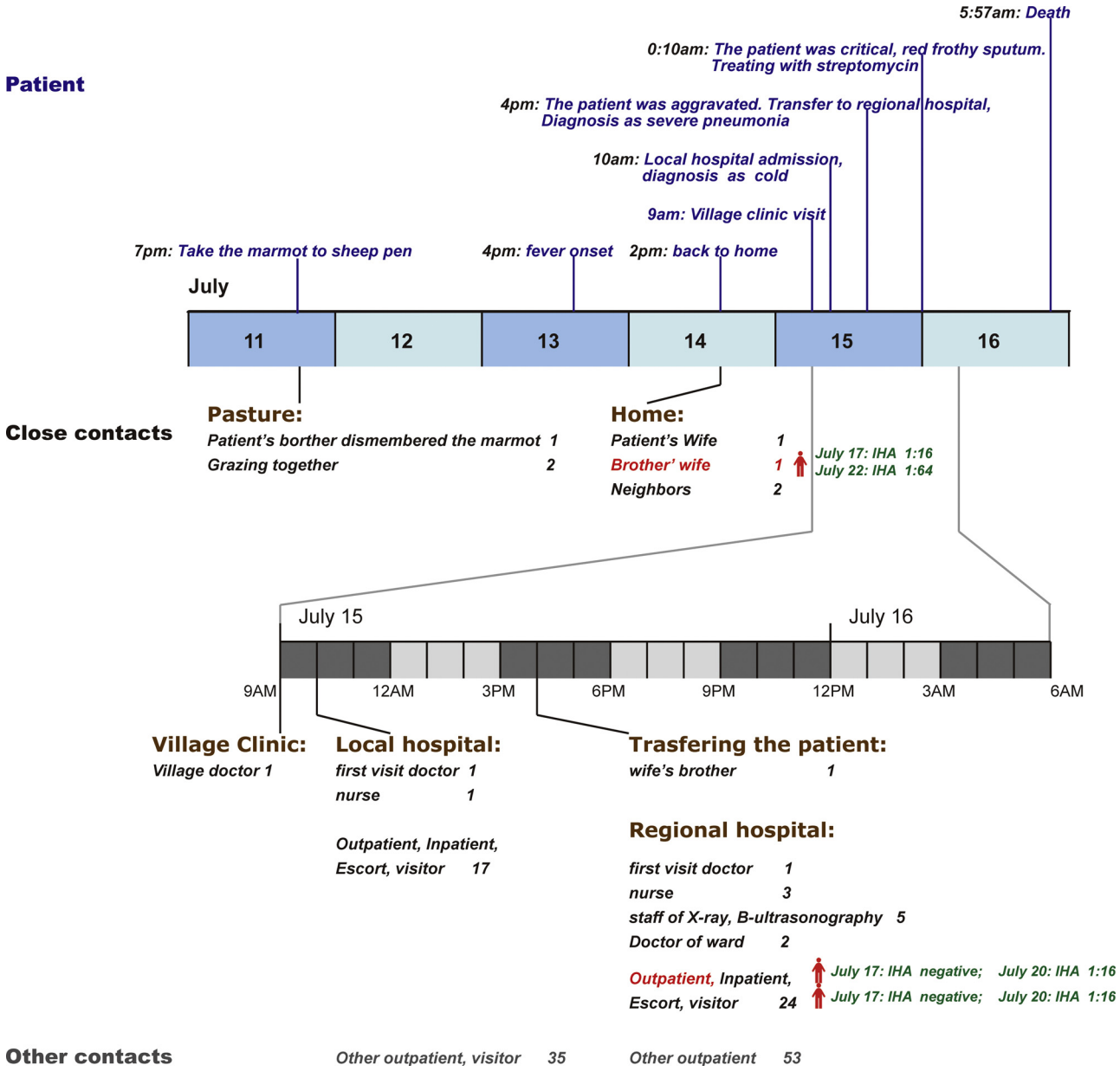

Figure 1. Epidemiology of the case of primary pneumonic plague (PPP).