Laboratory and Epidemiology Communications

Crimean-Congo Hemorrhagic Fever Due to Consumption of Raw Meat: Case Reports From East-North of Iran

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Communicated by Masayuki Saijo

Crimean-Congo hemorrhagic fever (CCHF) is a tick borne viral zoonosis with a mortality rate of 10%-50% that is caused by the CCHF virus (CCHFV) belonging to the genus Nairovirus of the family Bunyaviridae (1). The disease is endemic in extensive geographical areas including many countries in Africa, southeastern Europe, Asia, and the Middle East including Iran (2-3). Hard (Ixodid) ticks, especially Hyalomma, are both a reservoir and vector for the virus. Various wild and domestic animals, including livestock, are considered as amplifying hosts for CCHFV (1,4). Although infected animals may experience a mild to moderate fever that is often undetectable, CCHFV infection in humans can result in the development of serious clinical manifestations (5). The CCHF infection course can be classified into the following phases: incubation, pre-hemorrhagic, hemorrhagic, and convalescence. The manifestation of the disease is sudden, with infected individuals experiencing high fever, chills, severe muscle pains, headache, asthenia, and vomiting. In some cases, diarrhea, back pain, joint pain, and abdominal pain have been seen, where other symptoms such as red eyes, a flushed face, and red throat are common. After 3 to 5 days, different hemorrhagic signs such as petechiae, purpura, epistaxis, hemoptysis, hematemesis, melena, and hematuria may develop (6).

Human infection can occur from tick bites or direct contact with blood or tissues from infected livestock or humans. Additionally, consumption of under-cooked or raw meat may also transmit the virus to humans (7). Therefore, animal herders, abattoir workers, butchers, and healthcare workers are at risk of contracting CCHF.

In August 2015, 3 patients were admitted to 2 hospitals in the Khorasan-e- Razavi province of Iran, East-North of Iran. Case 1 was a 73-year-old man who was a butcher. He was admitted with a sudden onset of fever (>38°C), thrombocytopenia (17,000/μl), petechiae, and had a history of direct contact with blood and tissues from slaughtered sheep. Case 2 was a 23-year-old man admitted with a sudden onset of fever (>38°C), petechiae, dysentery, and thrombocytopenia (19,000/μl). He had a history of eating raw meat from freshly slaughtered sheep. Case 3 was the mother of case 2. She was a 50-year-old housewife who was admitted with an onset of fever (>38°C) and thrombocytopenia (49,000/μl). Like her son, she also had a history of eating raw meat from freshly slaughtered sheep. It should be noted that the meat, which was eaten by case 2 and case 3 (son and his mother), was sold by case 1 (the butcher). All 3 cases were subjected to ribavirin therapy and finally recovered.

Based on the guidelines of the National Expert Committee on Viral Hemorrhagic Fevers of Iran, all CCHF suspected samples were admitted in the National Reference Lab, Department of Arboviruses and Viral Hemorrhagic Fevers, Pasteur Institute of Iran.

The samples were subjected to the reverse transcription polymerase chain reaction (RT-PCR) test and all of them were positive for the CCHFV genome. Viral RNA was extracted from sera samples by the use of the QIAamp® Viral RNA Mini Kit (QIAGEN GmbH, Hilden, Germany) according to the manufacturer’s instructions. RT-PCR was performed as previously described (8). In brief, the RT-PCR mix consisted of 10 μl 5x QIAGEN One Step RT-PCR Buffer, 2 μl dNTP Mix (containing 10 mM of each dNTP), 0.6 μM of each primer (Iran F2: 5'-TGGACACCTTCACAAACTC-3' and Iran R3: 5'-GACAATTCCTACACC-3'), 2 μl QIAGEN OneStep RT-PCR Enzyme Mix, 500 ng of extracted RNA in a 50 μl total reaction volume. PCR products (536 bp) were sequenced by Macrogen Company (Macrogen Inc., Seoul, Republic of Korea) and verified by BLAST (http://blast.ncbi.nlm.nih.gov/Blast.cgi). All 3 sequences were submitted to GenBank under the accession number KU201597-9. Clustal W alignment revealed that these sequences were identical.

The majority of human infections in Iran have occurred among individuals involved in the livestock industry including animal herders, slaughterhouse workers, and butchers (9-10).
This paper reports a typical transmission of CCHFV to humans through direct contact with infected blood and/or tissue from livestock and consumption of infected fresh meat, suggesting that traditional slaughtering and butchery may put workers and their customers at risk of CCHFV infection. Considering that the consumption of raw meat might be a risk factor for CCHFV infection, it should be recommended that individuals living in those endemic regions consume well-cooked meat. In addition, it has been proposed that postmortem acidification of muscle may inactivate the CCHFV; therefore, keeping fresh meats in 4–8°C for 24 h can reduce the risk of infection. However, there is no scientific evidence that confirms this finding and thus further investigation is needed.

Butchery staff that work with infected meat or slaughter the animals may acquire the infection directly from the infected meat or animal’s fluid. Therefore, as an important preventive measure, traditional slaughtering should be limited, especially in places where there are not enough healthcare facilities to minimize the burden of CCHF. Importantly, individuals living in these endemic regions must be informed about the modes of CCHF transmission, including the consumption of under-cooked or raw fresh meat immediately after slaughtering.

**Conflict of interest** None to declare.

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