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

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Crimean-Congo hemorrhagic fever (CCHF) is a tick borne viral zoonosis with a mortality rate of 10–50%, caused by CCHF virus (CCHFV) belonging to genus *Nairovirus* of the family *Bunyaviridae* (1). The disease is endemic in extensive geographic area including many countries in Africa, southeastern Europe, Asia and Middle East including Iran (2-3). Hard (Ixodid) ticks especially *Hyalomma* are both 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, which is often undetectable, CCHFV infection in human can be with serious clinical manifestations (5). The CCHF infection course can be classified into: incubation, prehemorrhagic, hemorrhagic, and convalescence phases. The manifestation of disease is sudden, with high fever, chills, severe muscle pains, headache, asthenia and vomiting. In some cases, diarrhea, back pain, joint pain and abdominal pain have been seen. Other symptoms like 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 be occurred by tick bites or direct contact with blood or tissues of infected livestock or human. Additionally, consumption of the under-cooked or raw meat may also transmit the virus to human (7). Therefore, animal herders, abattoir workers, butcher and healthcare workers are at risk of CCHF.

On August 2015, 3 patients were admitted to two hospitals in Khorasan-e- Razavi province of Iran, East-North of Iran. **Case 1** was a 73-year-old butcher man with sudden onset of fever (> 38 °C), thrombocytopenia (17000), petechiae and a history of direct contact with blood and tissues of slaughtered sheep. **Case 2** was admitted with sudden onset of fever (> 38 °C), petechiae, dysentery and thrombocytopenia (19000). He was a 23-year-old man with a history of eating raw

meat of freshly slaughtered sheep. **Case 3** was the mother of case 2. She was a 50-year-old housewife who was admitted with onset of fever ($> 38\text{ }^{\circ}\text{C}$) and thrombocytopenia (49000). Like her son, she experienced eating raw meat of freshly slaughtered sheep. It should be noted that the meat which was eaten by case 2 and case 3 (son and his mother), sold by case 1 (the butcher). All 3 cases were subjected to ribavirin therapy and finally recovered.

Based on the guideline of National Expert Committee on Viral Hemorrhagic Fevers of Iran, all CCHF suspected samples were admitted in the department of Arboviruses and Viral Hemorrhagic Fevers (National reference Lab) of Pasteur institute of Iran.

The samples were subjected to Reverse Transcriptase PCR (RT-PCR) test and all of them were positive for CCHFV genome. Viral RNA was extracted from sera samples by the use of QIAamp® Viral RNA Mini Kit (QIAGEN GmbH, Hilden, Germany) according to manufacturer's instruction. RT-PCR was performed as previously described (8). In brief, the RT-PCR mix consisted of 10 μl 5x QIAGEN OneStep RT-PCR Buffer, 2 μl dNTP Mix (containing 10 mM of each dNTP), 0.6 μM 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 three sequences were submitted to GenBank under the accession numbers KU201597-9. Clustal W alignment revealed that these sequences were identical.

The majority of human infections in Iran have occurred among people involving in the livestock industry including animal herders, slaughterhouse workers and butchers (9-10).

This paper reports a typical transmission of CCHFV to human through direct contact with infected blood and/or tissue of livestock and consumption of infected fresh meat, suggesting that traditional slaughtering and butchery may put involved workers and also their customers at risk of CCHFV infection. Considering that the raw-meat consumption might be a risk for CCHFV infection, well-cooked meat should be recommended for people in the endemic regions to be eaten. In addition, it has been proposed that postmortem acidification of muscle may inactivate the CCHFV, so keeping fresh meats in 4-8 °C for 24 hours can reduce the risk of infection. However it is not scientifically evidenced and further investigations are needed.

Butchery staffs who work with infected meat or slaughter the animals may acquire the infection directly from infected meat or animal's fluid. Therefore, as an important preventive measurement, traditional slaughtering should be limited, especially in the places where there are not enough health care facilities to minimize the burden of CCHF. Importantly, people in endemic regions must be informed about the routes of CCHF transmission including the under-cooked or raw fresh meat immediately after slaughtering.

Conflicts of interest: The authors have no conflict of interest to declare.

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