



# Report of a Family with Crimean-Congo Hemorrhagic Fever Following Contact with Frozen Meat: A Case Series Study

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## Abstract

**Introduction:** Crimean-Congo hemorrhagic fever (CCHF) is caused by a tick-borne virus in the family of Bunyaviridae. A hard tick, in the genus of *Hyalomma*, is a reservoir and also a vector for CCHF virus. Infection in humans usually occurs by infected tick bite or through contact with infected animal tissues and blood. CCHF can also transmit from one infected person to another through contact with infectious blood or body fluids. Human-to human transmission is also reported as a nosocomial infection.

**Case Presentation:** Here, we presented 5 patients from a family with Crimean-Congo hemorrhagic fever, who got the illness at the same time when they cut the frozen meat together. Fortunately, all patients referred to hospital soon and received treatment during 24 to 72 hours after the first sign or symptom was presented.

**Conclusions:** Frozen meat can transmit CCHFV to humans, which can be due to high viral load or a virus with high virulence in the infected animal tissues.

**Keywords:** Crimean-Congo Hemorrhagic Fever, Refrigerated Meat, Infected Family

## 1. Introduction

Crimean-Congo hemorrhagic fever is a viral disease caused by a hard tick in the genus of *Hyalomma*. *Hyalomma* tick is a reservoir and also a vector for the CCHF virus (1-3). Many animals including goats, sheep, cattle, camel, and hares are major hosts for this virus.

Humans usually acquire infection through infected ticks bite or contact with infected animal tissues. CCHF can also transmit from the infected person to another person through contact with infectious body fluids, such as infected blood (1, 4-8). Transmission of CCHFV has been reported in hospitals because of improper sterilization of medical equipment, through needle sticks, and air among patients who have been hospitalized in the same wards.

Birds are resistant to this infection, but ostriches are susceptible and can be a source of infection in endemic areas (1, 9-11). Today, CCHF is endemic in Africa, the Middle East, Eastern European countries, and Asian countries such as Iran, Turkey, Pakistan, and Afghanistan. Following infection by a tick bite, the incubation period is usually 1 to 3 days, with a maximum of 9 days, which is longer than the patient has a contact with infected animal tissues

(1, 3, 4). The onset of symptoms is usually sudden, with fever, myalgia, neck and back pain, headache, sore throat, or nausea, vomiting, diarrhea, and abdominal pain. Clinical signs include lymphadenopathy, hepatomegaly, and bleeding into the skin and in mucosal surfaces, such as in the nose and mouth. The mortality rate from CCHF is approximately 30% to 70%. Death mainly occurs in the second week of disease and in patients who have survived, improvement begins about 10 days after the onset of illness (2, 3, 6). CCHF virus infection can be diagnosed by several different laboratory tests such as enzyme-linked immunosorbent assay (ELISA), serum neutralization (SN), reverse transcriptase polymerase chain reaction (RT-PCR) assay, and by cell culture to isolate the virus (12-14). Treatment is supportive, but ribavirin (an anti viral drug, both oral and intravenous formulations) has been used to treat CCHF infection with apparent benefit in previous reports (15-22). Prevention of the virus in animals is difficult because infection in animals is usually not symptomatic. On the other hand, the tick vectors are widespread. However, tick control with acaricides can be a suitable option for well-managed livestock production facilities (1-3, 23, 24). Here, we present 5

patients of a family who got CCHF following a contact with sheep meat just 40 hours after the sheep was slaughtered. They froze the meat for 30 hours, then, they put frozen meat in the open air for 10 hours and then cut it.

CCHF was confirmed by RT-PCR and ELISA tests in these patients.

## 2. Case Presentation

### 2.1. Case 1

On May 21, 2016 a 39-year-old male was admitted to our hospital (Boo-Ali hospital, located in Zahedan, South-eastern Iran) because of fever, body-pain, abdominal pain, headache, nausea, and vomiting from 48 hours ago. The above manifestations appeared about 2 days after he bought the meat and froze it for 30 hours and then he had placed the meat out of freezer for 8 hours. Then, he cut the meat with other family members. On admission time, his oral temperature was 38.9°C and blood pressure was 100/50 mmHg. The cardiac examination was normal. No other abnormal signs were detected. A complete blood count revealed a white blood cell count of  $1.7 \times 10^9/L$  (Neutrophils 32% and lymphocytes 59%), hemoglobin of 13.4 g/dL, and a platelet count of  $63 \times 10^9/L$ . Serum creatinine was 0.9 mg/dL and liver function test including aspartate aminotransferase (AST) and alanin aminotransferase (ALT) were 70 and 38 u/L, respectively. Prothrombin time (PT) and partial thromboplastin time (PTT) were in the normal range. He received supportive management and oral ribavirin was initiated. Three days later, clinical manifestations were improved, but platelet was decreased to  $33 \times 10^9/L$ . Blood sample was sent to reference laboratory to detect CCHF virus on Day 0, 3, and 10 day of hospitalization.

### 2.2. Case 2

On May 21, 2016 a previously healthy 44-year-old male was admitted to our hospital because of fever, abdominal pain, headache, nausea, vomiting, and diarrhea from 24 hours ago. He was the oldest son of the family who helped his mother and brothers to cut the meat. On admission, his oral temperature was 38.7°C and no other abnormal signs were detected.

A complete blood count revealed a white blood cell count of  $5.4 \times 10^9/L$ , hemoglobin of 11.9 g/dL, and a platelet count of  $92 \times 10^9/L$ . Liver function test including AST (125 u/L), ALT (66 u/L), PT (16 seconds) and PTT (55 seconds) were abnormal. A CBC on the second admission showed severe thrombocytopenia ( $18 \times 10^9/L$ ). He went under supportive management including transfusion of platelet, and oral ribavirin was initiated. Then, 5 days later clinical manifestations were improved and platelet was increased to  $71 \times 10^9/L$ .

### 2.3. Case 3

This case was a 35-year-old male, who was referred with his brother and mother to our hospital.

He also had a contact with the meat and his clinical manifestations were fever, nausea, vomiting, and abdominal pain. CBC showed mild thrombocytopenia ( $51 \times 10^9/L$ ) and because other family members were not in good condition, we started ribavirin and he was admitted to infectious ward. Other tests were normal and he was improved with treatment.

### 2.4. Case 4

On May 19, 2016 a 63-year-old female, who was the mother of the 3 above cases, was referred to our hospital because of fever, headache, and confusion. She was admitted to our hospital and a CBC revealed a severe thrombocytopenia ( $21 \times 10^9/L$ ), which decreased to 8000 on the day of admission. ALT and AST were > 3 upper limit normal and INR was 1.3. On the second day of admission, WBC was  $2.3 \times 10^9/L$  and platelet was 20,000. She also had a history of contact with the animal tissue and helped her sons to cut the meat. Clinical diagnosis of CCHF was made and ribavirin was started. Despite the supportive cares and treatment with ribavirin, the patient's clinical status worsened rapidly and she had hematemesis, melena, and nasal bleeding. Also, extensive ecchymosis and petechia were observed. She was sent to ICU, she was in good condition after 9 days.

### 2.5. Case 5

The fifth case was a 34-year-old male, who helped his family in cutting the meat, and 2 days later he was referred to hospital for fever, nausea, vomiting, abdominal pain, and nasal bleeding. CBC showed severe thrombocytopenia (17,000) and leukopenia (3,000). Therefore, ribavirin was started and he received supportive care including platelet transfusion. Then, 4 days later, he was in good condition and treatment continued for 10 days. RT-PCR and ELISA for all 5 cases were sent to reference laboratory and the tests confirmed CCHFV.

## 3. Discussion

Crimean-Congo hemorrhagic fever is a zoonotic viral disease and is caused by a tick-borne virus. It is endemic in Africa, Asia, the Middle East, and in Eastern Europe, with a mortality rate of 40% to 70% (1, 4). This disease is generally asymptomatic in infected animals and about 75% asymptomatic in humans, but it can be highly fatal in humans (3, 4, 6). In humans, the disease presents as a non-specific febrile syndrome and progresses to a severe hemorrhagic

form (1). Although ticks are major vectors in transmission of the virus, human to human transmission via percutaneous or per mucosal exposure to infected blood and body fluids can occur. Human-to-human transmission is also reported through a form of nosocomial infection. Important risk factors include slaughter, agricultural workers, and veterinarians who are in contact with infected livestock (1, 2, 6, 9, 24). Tick bite history and living in a rural areas are the most common risk factors for acquiring CCHF in adults and children in many of studies, which have been reported from Iran (3,4,6,24). Consumption of under-cooked meat is also a risk factor, so the virus is inactivated by high temperature and cooking (2). The geographic distribution of CCHF is closely associated with being of hard ticks in area, which are the natural reservoir of CCHFV. Possible causes for re-emergence of CCHF are climate changes, which may have a significant impact on the reproduction rate of the vector ticks, thus, jobs and agricultural activities can be important factors in this infection. Patients with CCHF present with a wide range of clinical manifestations and severity from asymptomatic form, such as only fever, or fever with flu-like syndrome, to hemorrhage with multiple organ failure which results in death (1, 2, 6, 9). The time course of the typical infection consists of 4 phases: incubation (3 -14 days), prehemorrhagic phase (1- 7 days), hemorrhagic (2 -3 days), and convalescent (1- 6 months). The hemorrhagic period in typical CCHF cases rapidly develops between 3 and 5 days from onset of disease. Oliguria is not an unusual symptom, which is associated with renal failure caused by the direct influence of CCHFV infections or through hypovolemic shock. Severe cases

usually progress to disseminated intravascular coagulation (DIC), leading to the coagulopathy and severe thrombocytopenia(1,3,5,6). Many reports have been shown that contact with infected animal tissue and blood have transmitted the virus to humans. Also, consumption of uncooked meat can also transmit the infection to humans (1-15). Five years ago, we reported 4 patients with Crimean-Congo hemorrhagic fever, who acquired the illness following consumption of uncooked sheep liver (2). Among 4 patients, 3 were admitted to our hospital about 36 hours after eating the liver. Although they had acute fever and prompt treatment, they responded to supportive therapy and ribavirin. Unfortunately, one patient, who was referred to hospital late and whose treatment started just 5 days after the beginning of the first sign, died (2).

In the present study, we faced with 5 cases ( a mother and her 3 sons) ,and a man who was a friend and also the brother in-law of the oldest son, who helped the family to cut the meat. RT-PCR and ELISA tests in reference laboratory were positive in all patients. The difference between this report and the previous report was that in the latter

present report the meat was frozen for 30 hours and was then placed out of freezer for 8 hours. In the previous report, the meet has been used uncooked sheep liver. We conclude that frozen meat can not prevent transmission of infection. Moreover, it seems that the virus can survive even in freezing condition due to high viral load or high virulence of pathogen in the meat and contact with such meat can lead to infection.

We could not find any research in this field. There is only one study about the survival of porcine circovirus Type 2 in very low temperature (25). Porcine circovirus Type 2 (PCV2) caused a disease in domestic pigs, which is very damaging to the pig-producing industry and has been reported worldwide (26). Their data showed that PCV2b can survive in pork at 25°C for up to 2 days, at 4°C for up to 6 days, and for 30 days at -20 °C. These results emphasized that survival of the virus in fresh pork is independent of temperature of the storage (25).

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#### Footnotes

**Authors' Contribution:** All authors had an equal role in writing the paper.

**Conflict of Interest Statement:** None declared.

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