

CRIMEAN-CONGO HAEMORRHAGIC FEVER: A SEROLOGICAL SURVEY IN DROMEDARY CAMELS

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ABSTRACT

Crimean-Congo Haemorrhagic Fever (CCHF) is a tick-borne viral infection caused by a tick-borne virus (Nairovirus), a negative sense, single-stranded RNA virus in the family *Bunyaviridae*. A serological survey conducted on 173 camel sera from the United Arab Emirates (UAE), Pakistan, and Kazakhstan showed a high CCHF serological prevalence of 94.2%.

Key words: Antibody ELISA survey, CCHF, dromedary camels, tick-borne viral infection

Crimean-Congo Haemorrhagic Fever (CCHF) is caused by a tick-borne virus (Nairovirus), a negative sense, single-stranded RNA virus in the family *Bunyaviridae*. It is a human viral disease that was first found in the Crimea in 1944 and therefore given the name, Crimean haemorrhagic fever. In 1969, the disease was also detected in Congo, thus resulting in the current name of the disease (Appannanavar and Mishra, 2011). The virus has been found in wide areas of South Africa, Southern Europe, Eurasia, and Western China as shown in the following map (Fig 1).

The virus replicates in the host tick as it passes from larval to adult stages (transstadial transmission) and it can also be transmitted from one generation of ticks to the next (transovarial transmission). Thus, the tick is not only the disease vector, but also a reservoir (The Merck, 2016). Thirty species of ticks, particularly the genus *Hyalomma*, the most prevalent tick in the Arabian Peninsula, is the vector of the CCHF virus, but it has also been isolated from other genera of ixodid ticks. CCHF is a severe haemorrhagic viral disease of humans acquired from tick bites, tissues of

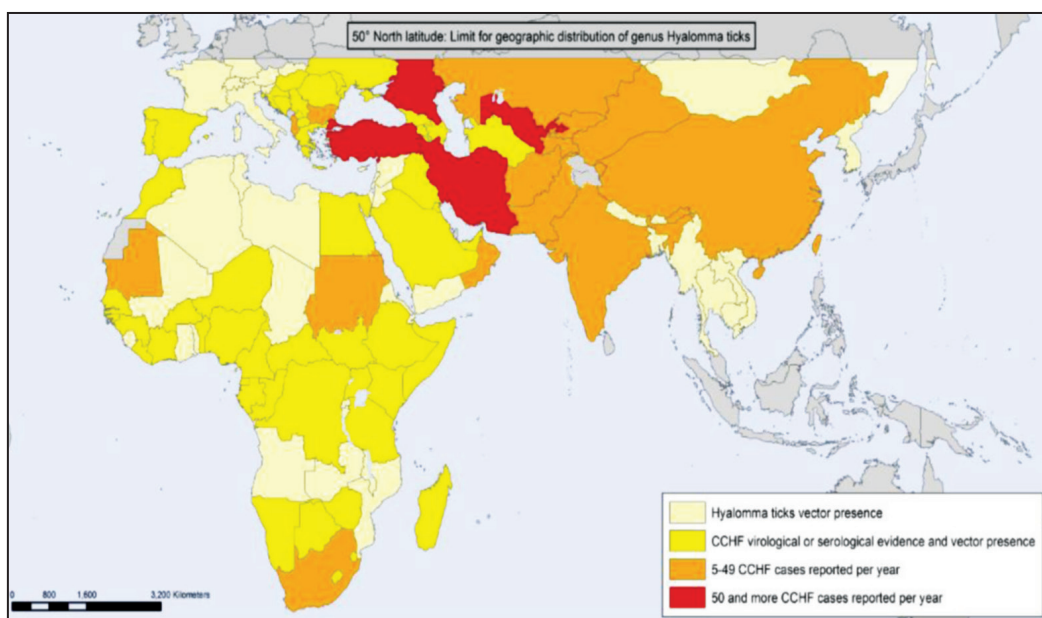


Fig 1. Geographical distribution of CCHF. Downloaded from https://www.who.int/images/default-source/health-topics/crimean-congo-haemorrhagic-fever/global-cchfrisk-2017.png?sfvrsn=4b961c4c_6 on December 13, 2020.

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infected wild or domestic animals and human patients with the disease.

It is primarily an occupational disease seen in butchers, veterinarians, animal handlers and farmers (Sahak *et al*, 2019). However, sporadic human cases have been reported in the UAE. For example, in 2010, two fatal human cases of CCHF were reported by Dabal *et al* (2016) in a hospital in Dubai, UAE.

Animals seem to be immune to the virus, but many different animal species have produced antibodies against CCHF.

A serological survey was conducted on camel sera from the UAE, Pakistan and Kazakhstan with a sandwich antibody ELISA, the results of which are reported here.

Materials and Methods

For the serological investigation of the dromedary sera, a novel double-antigen sandwich ELISA was used. It is a multispecies antibody ELISA from ID Vet, named ID Screen® CCHFV double antigen multispecies ELISA. This ELISA has a specificity of 100% and a sensitivity of 99% for the detection of CCHF antibodies. The ID Screen® uses a recombinant purified CCHF nucleoprotein antigen-HRP. The cut-off stands at 30%.

In total 173 camel sera including 8 Bactrian camels introduced from Kazakhstan and 8 hybrid camels between Bactrian and dromedary camels bred in Dubai were tested which is shown in Table 1. Also, 46 camel sera, tested from the Dubai area included 5 sera that had been collected in 2011.

Table 1. Number and origin of camel sera tested for CCHF antibodies at CVRL.

Origin	Number
Pakistan	49
Dubai	46
Fujairah Bactrians (Kazakhstan)	8
Hybrid camels	8
CVRL dromedary	11
Dubai surroundings	51
Total	173

Results

Results of the ID Screen® CCHF double antigen multi-species antibody ELISA are summarised in Table 2. Of the 173 camel sera tested, 10 of them were negative which is 5.7% and 94.2% were positive. Dromedary sera from Pakistan had a seroprevalence of 98%, 8 Bactrian camels introduced

from Kazakhstan to Fujairah (UAE) were all positive, whereas hybrid camels raised in Dubai displayed a seroprevalence of 75%. Dromedary camels in and around Dubai showed a seroprevalence between 88 and 100%.

Table 2. Competitive CCHF antibody ELISA results of 173 camel sera of different origin.

Origin	Number	ELISA positive samples (%)
Pakistan	49	48 (98%)
Dubai	46	46 (100%)
Fujairah Bactrian (Kazakhstan)	8	8 (100%)
Hybrid Camels	8	6 (75%)
CVRL	11	10 (91%)
Dubai surroundings	51	45 (88%)
Total	173	163 (94.2%)

Discussion

CCHF is enzootic, but asymptomatic in many animal species such as cattle, sheep, goats, camels, and hares (Schwarz *et al*, 1996). Several reports deal with the detection of CCHF antibodies from different animal species as well as the isolation of this virus from animals. An overview of the literature was compiled by Wernery *et al* (2014). In experimental inoculations with the CCHF virus, sheep and cattle become infected but do not produce disease. IgG ELISAs detect life-long antibodies and antibody prevalence in adult livestock species may reach more than 50% in endemic regions (The Merck, 2016).

In a recently published paper, Camp *et al* (2020) indicated that exposure to CCHFV is common among camels in the UAE, suggesting that the virus is endemic in this country. The researchers found CCHFV ELISA antibodies in 67% of dromedary sera from the UAE, a percentage which is lower than found in our study with 88 to 100%. Interestingly, a small number of camel sera which had been collected in 2011 were all positive. Additionally, dromedaries from Pakistan and Bactrians from Kazakhstan introduced into the UAE possessed a high CCHF seroprevalence. Also, hybrids between Bactrian and dromedary camels bred in the UAE showed a 75% positivity to the CCHF virus. Both research groups used the same competitive ELISA.

Camp *et al* (2020) not only showed a high CCHF serological incidence in the UAE dromedary camels, but also obtained CCHF viral RNA from *Hyalomma dromedarii* ticks and camel sera. This showed

that transmission to camels is via native infected *Hyalomma dromedarii* ticks which is the most common tick in the UAE. Interestingly, in a previous survey of the UAE livestock around 1995, camels and camel ticks were ruled out as CCHFV reservoirs (Rodriguez *et al*, 1997). Our investigation shows that over the last 25 years CCHF seroprevalence in dromedary camels has increased significantly in the UAE and poses a severe risk to people working with camels. The lack of significant clinical signs in livestock warrants no treatment considerations for animals. However, controlled strategies for human beings' infection should include the avoidance of tick bites by using insecticides when camels which harbour ticks are treated. Tick control must also be practiced before slaughtering or grooming animals.

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